KIMO INSTRUMENTS

User manual

Pressure / Temperature / Humidity / Air velocity / Airflow / Sound level

DS200

Noise dosimeter

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1. Introduction

The DS200 noise dosimeter is measuring instrument allowing measurement of sound exposure at workstation.
In accordance with international standards, DS200 calculates values usually used for comparison with regulations on exposure value.
With its memory, DS 200 instrument stores measurement dataset. Then they are transferred on a computer and processed through **LDS23** software supplied with the instrument.
The optional LDS300 software will allow a more detailed analysis in accordance with EN ISO9612 : 2009 standard.
In addition, this noise dosimeter contains a conventional sound level meter function for a first estimation of the noise environment of workplace

DS200 comes in a small case with ergonomic design. It can be easily put on a belt or in a pocket of people at workstation. The microphone, at the end of the extension, is attached thanks to the kit specially developed to minimize the disruptions caused by impact or clothes frictions.

Measurements are stored in a MicroSD memory of large capacity giving to the whole a measurement capacity almost unlimited.
With its backlighted LCD screen, DS200 is also a conventional and integrating-averaging sound level meter for a a quick estimate of the noise in the workplace.
In measurement mode, it can inform person about the levels through a two coloured light.

Main features :

Noise dosimeter and conventional sound level meter with backlighted LCD graphical display.

- Extension electret microphone of diameter 3/8" (9.52 mm), small size allowing a reliable fixing.
- 2 dynamic ranges : 40-120 / 60-140 dB
- A and C frequency-weighted simultaneous measurement for Leq and C or Z for LpK
- Management of peak pressure levels excesses 135-137-140dB
- Calculation and results complying with EN ISO 9612 : 2009 standard
- Measurement programming for deferred and/or repetitive starts
- Keyboard protection during measurement and against unwanted stops
- Visual alarms
- Storage capacity on microSD : 99 sessions of more 24H00 each
- Li-Ion battery for a battery life more than to 30 hours

DS200 is supplied with LDS23 software which can very easily transfer data to computer for :

- Visualize global or more detailed measurement data
- Process unmeasurement areas (pause - start/end of measurement...)
- Customize a report for saving and printing

2. Generality

2.1. Regulation

The prescriptions regarding the exposure of workers to the risks are mentioned in the 2003/10/EC European Directive. From these controls, the obtained results are compared to defined regulatory action thresholds.

These thresholds are based on two parameters :

- the daily noise exposure level (Lex, 8h in dBA)
- the C frequency-weighted LCpeak peak pressure level

In case of threshold excesses, actions have to be done. The regulation specifies two action thresholds that lead to preventive actions :

- lower exposure value – Lex;8h>80 dBa and LCpk>135 dBC
- upper exposure value – Lex,8h>85 dBA and LCpk>137 dBC

These two thresholds are complemented by a third one called Exposure Limit Value, which should not be exceeded under any circumstances :

- Lex,8h> 87 dBA and LCpk > 140 dBC

2.2. Labour law

It is mainly based on Articles R4433-1, R4433-2 and R4433-7 and complemented by the Decree of July 19, 2006.

2.3. Measurement

It is mainly based on Articles R4433-1, R4433-2 and R4433-7 and complemented by the Decree of July 19, 2006.
The measurement must be done in compliance with prescription of the EN ISO9612:2009 standard.
Principle :
the standard recommends three methods of measurement :

- by task
- by profession or function
- by fully day

This standard also adds the measurement processing including the estimation of measurement uncertainty.

2.4. Noise exposure – Exposure points

This simplified method is well adapted for workers whose workstation is constituted by several identifiable tasks. The difficulty of “summons” dB levels does not allow a fast approach of the daily nose exposure level, using this method provides a very significant operational flexibility.
It takes into account nose exposure expressed in Pa^2h of various tasks that can be added to get an daily global nose exposure. From that, determination of Lex,8h daily exposure becomes easier with a research in a dedicated corresponding table. This table is available in the ED6035 document published by the INRS.

DS200 dosimeter calculates noise exposure and displays on its screen the number of exposure points of the task performed by the worker on his workstation.

3. Vocabulary

LAF40 : A-weighted acoustic pressure level, Fast time constant – range 40-120
LAS40 : A-weighted acoustic pressure level, Slow time constant – range 40-120
LAF60 : A-weighted acoustic pressure level, Fast time constant – range 60-140
LAS60 : A-weighted acoustic pressure level, Slow time constant – range 60-140
LCpK : C-weighted peak pressure level referring to 20µPa
LZpK : Z(Lin)-weighted peak pressure level referring to 20µPa

Raz : resetting of maximum or minimum values calculations memorized of measured values
Sto : data saving and storage on MicroSD

DI : Elementary integration time, programmable from 1s to 60s for calculation of the equivalent continuous stored into the memory
LAeq,DI : A-weighted equivalent continuous level on the integration time DI
LCeq,DI : C-weighted equivalent continuous level on the integration time DI
LAeq,T : A-weighted equivalent continuous level on the whole measurement duration T
LCeq,T : C-weighted equivalent continuous level on the whole measurement duration T
Lex,d : A-weighted daily exposure level
EA,T : nose exposure on the measurement duration T, expressed in Pa²h
EA,d : nose exposure on the normalized duration 8 hours, expressed in Pa²h
Dose : dose of noise expressed in % - Reference : 85 dBA for 8 hours
Lc : reference level for the calculation of the dose : 85 dB
Tc : reference duration for the calculation of Lex,d and dose : 8 hours
P.exp : exposure points – 1 exposure point = 0.01 Pa²h
L135-L137-L140 : symbols for the detection of peak pressure levels of 135-137-104 dB

SXX : order number of the measurement sessions. Limited to 99.
EY : order number of screens from 1 to 4.
Dd : start date of the measurement. Form : 00/00/00
Hd : start hour of the measurement. Form : 00:00
Df : End date of the measurement. Form : 00/00/00
Hf : end hour of the measurement. Form : 00:00
V : measurement channel – 1 or 2 (optional)
A//C : simultaneous measurement according 2 frequency-weightings : A and C
00/00:00:00 : measurement duration form in day/hours:minutes:seconds
00:00 : time form in hours:minute
00/00/0000 : date form – DD/MM/YYYY
Alarm : two coloured visual alarm fir detection
Ref : reference level for calibration
Cr.CI : correction term in free field in calibration mode

4. Operation principle

4.1. Keypad presentation

When starting the instrument, the screen specifies 3 operating modes. These modes are available from **1**, **2** and **3** keys. **5** key allows to go to setting reading or data transfer screens. To back to start screen, press **4** key.
During measurement, **4** key also allows to quit operating screen.

① ② ③ Function keys
Directly associated to texts shown above on LCD screen, they allow measurement settings and modes selection

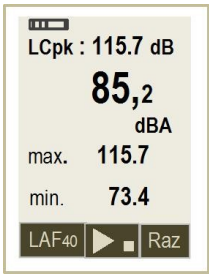
④ **Key** "leaves current screen"

⑤ **Screen key**
From measurement screens, it gives access to other screens

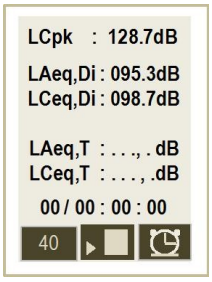
⑥ **On/Off** key

4.2. Screens presentation

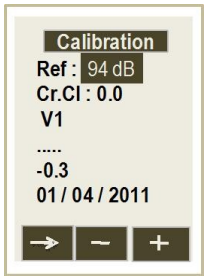
- 3 screens represent the different measurement and calibration modes accessible with 1-2-3 keys :



Conventional sound level meter

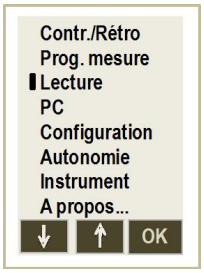


Dosimeter-exposimeter with storage



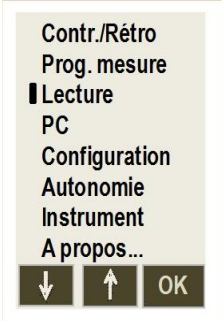
Calibration

- Press 5 key to show the screen of choice of different settings

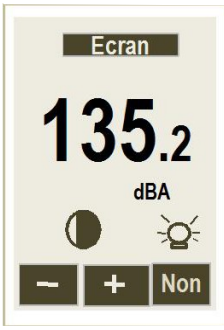


5. Settings

Instrument setting is for all the useful and necessary operations for the success of the measurement, to read data or to transfer data. It also gives informations about the international standards, the element of the instrument and the date of last checking.
Important : this “measurement setting” is automatically saved and loaded for the next measure



5.1. Brightness / backlight



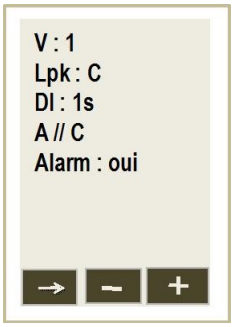
To optimize display reading :

- Set the brightness by pressing function keys **1 and 2.**
- Backlight the LCD screen for an easy reading in dark place.

“No” means backlight is not activated and **“Yes”** means that backlight is activated.
When backlight is activated, battery life is reduced by 15%.

Note : a short press of **On/Off key** activates or deactivates backlight at any time.
In exposimeter integrating mode, backlight will be automatically deactivated after some time to save battery life.

5.2. Measurement programming



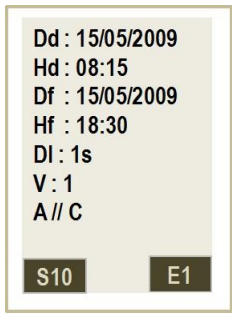
To be performed before starting a measurement. Parameters must be set according to measurement conditions and adopted measurement strategy.

- Press **1 key** to move the cursor.
- Change the suggestion in reverse video pressing **2** or **3 key**.

V : concerns the number of measurement channels. Here, only 1 channel.
Lpk : select C or Z for the peak pressure weighting. Usually, C weighting is preferred.
Di : select the duration of elementary integration of the equivalent continuous level for a proper representation of the time evolution. This duration varies between 1 and 60 s with a 1 s step. Usually, the duration of 1 s is preferred.
A//C : 2 possibilities are proposed :
the measurement of the Leq equivalent continuous level with the A-frequency weighting. Select the item A.
the measurement of the Leq with A and C weightings simultaneously. Select the item A//C.
This last setting allows to estimate the sound exposure in case of use of individual noise protection according to the HLM method and ISO 4969-2 standard.
Alarm : concerns the activation of the lighting on the top of the housing, visible by the exposimeter holder or the technician in charge of the measurement following.

- Select **Yes** to make visible the following informations :
  - **Orange :** in case of exceeding at least one of the following values
    - Lpk > 135 dBC or Z
    - LAeqDi, or LAeq,T > 80 dBA
    - Dose > 31.62%
  - **Red :** in case of exceeding at least one of the following values
    - Lpk > 137 dBC or Z
    - LAeqDi, or LAeq,T > 85 dBA
    - Dose > 100%

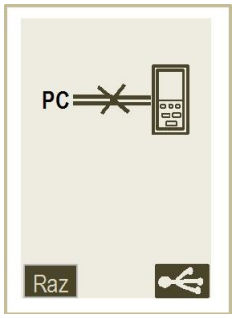
5.3. Reading



This screen allows to get to the main results of the different measurement sessions stored in the instrument.

- Scroll with **2 or 3 keys** the sessions numbers to get the required session.
  The screen gives informations about date and time of measurement starting and end and about the measurement setting.
- Press **1 key** to read the totality of other results of the selected session.
- Scroll with **3 key** the different screens in relation with the session.
- Leave the session pressing **4 key**.

5.4. PC



From this screen :

- Press **1 key** to empty the memory of the instrument.
- Press **1 key** again to validate or **4 key** to cancel.

This screen also allows to connect the instrument to a computer. See page 18.

5.5. Configuration

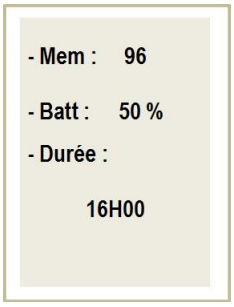
From this screen :

- Use **1 key** to move the cursor in the requested area.
- Modify the suggestion with **2 and 3 keys**.

The parameters to set are the following :

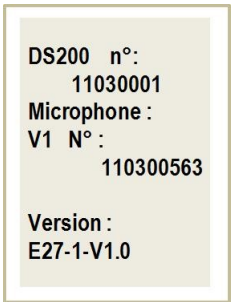
- **Language :** French or English
- **Date/Time :** set date and time

5.6. Autonomy



The autonomy gives information about the remaining memory capacity, expressed in measurement periods and about the possible measurement duration according to the remaining capacity of the battery.
Ex : 99 means that the instrument can perform 90 measurement sessions (1 measurement = 1 work station).

5.7. Instrument



This screen gives information about the items of the noise dosimeter :

- the instrument and its serial number
- the microphone and its serial number
- the version number of the firmware

5.8. About...

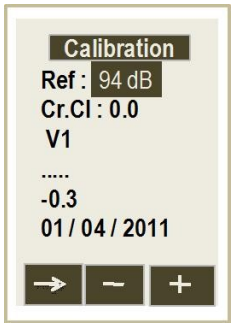
This screen gives information about the manufacturing origin, the reference standards of the instrument and the dates of last and next checking.

6. Calibrate the instrument

Before each measurement series, a calibration must be performed with an appropriate calibrator. A control shall be also performed at the end of the measurement. The deviation between both calibrations must not be higher than 0.5 dB. If this deviation is higher than 0.5 dB, the performed measurements are questionable.

Reminder :
A reference source of noise such as a calibrator supplies a noise pressure level. During a free field measurement, phenomenons of diffraction caused by the microphone and the housing come to disrupt the measurement. This disruption is minimized if the microphone is far from the housing. For the DS200, the induced disruption in free field is very weak, it is not necessary to introduce a free field correction.

6.1. Perform the calibration

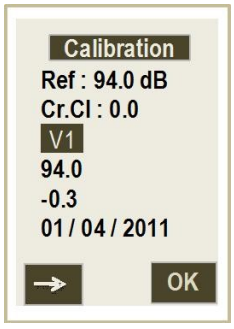


From the starting screen :

- Press **Cal.**
  The instrument displays a new screen.
- Check that the reference value and the free field Cr.CI correction value correspond to the calibrator used (0.0 dB for DS200).
- Turn on the calibrator and put it on the microphone.
- Put the cursor on **V1**.
  *The instrument automatically adjusts the gain of the channel to obtain the coincidence of the levels displayed in **Ref** and **V1**.*
  When the measurement is stabilized, a pictogram OK appears.
- Press **3 key** to validate.
  At this moment the correction value of the gain and calibration date are memorized and visible for the next calibration.
- Quit calibration function pressing **4 key**.

Note : This correction can not exceed **+/- 2 dB**. If the correction exceeds **+/- 2 dB**, the coincidence values in **Ref** and **LCF** is not obtained. Reasons of this difference shall be identified (defective microphone, level value of the calibrator not adapted...).

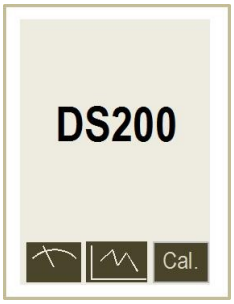
6.2. Modify the reference value



The preset reference value during manufacturing process shows that we use calibrator with rated value of 94 dB at 1000 Hz. To modify it :

- Put the cursor on **Ref** with **2 or 3 key.**
- Adjust at the required value, dB per db.

7. Conventional sound level meter



The DS200 has 2 running modes :

- conventional sound level meter
- Noise dosimeter-integrator averager

These 2 functions are activated by pressing 2 or 3 key linked to the pictograms. Before each measurement, it is advised to calibrate the instrument (see page 12).
From the starting screen, press **1 key.**

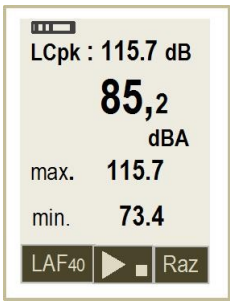
The DS200 processes the sound pressure signal and displays at the same time the following informations :

- Temporally weighted sound pressure level.
- Maximum and minimum values of levels on the measurement time.
- Level of maximum peak sound level on the measurement time.

2 selections of dynamic ranges are possible :

- 60-140 dBA for the measurement of sound atmospheres in a noisy industrial environment
- 40-120 dBA for the measurement of sound atmospheres in services sector or low noisy industrial environment

7.1. Set the instrument before the measurement



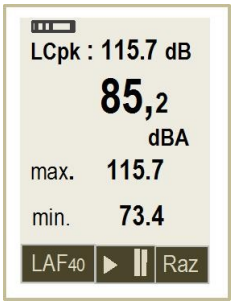
➢ Select the measuring range and the time constant by pressing the **1 key.**

For the a A-frequency weighting, the instrument proposes the measurement according to 2 dynamic ranges and 2 time constants : Fast (F), Slow (S). Possible selections are :

- LAF40 : dynamic range of 40-120 dB – A-frequency weighting – F fast temporal weighting
- LAS40 : dynamic range of 40-120 dB – A-frequency weighting – S slow temporal weighting
- LAF60 : dynamic range of 60-140 dB – A-frequency weighting – F fast temporal weighting
- LAS60 : dynamic range of 60-140 dB – A-frequency weighting – S slow temporal weighting

Note : C or Z frequency weightings of sound pressure peak level must be selected in **"Measurement programming"** menu.

7.2. Perform a measurement



Measurement is immediate.
During measurement, two actions are possible :

- reset memorized levels.
- hold measurement thanks to pause function.

To **reset** all the values :

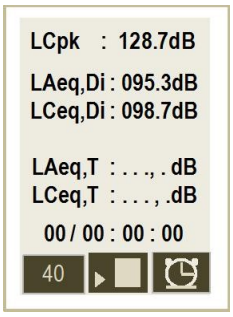
➢ Press **3 key** (**Raz** pictogram), resetting affects :
  - **LAF** or **LAS** maximum and minimum levels
  - **LCpk** maximum peak pressure value
  - information about overload

Pause function allows to stop the measurement in progress to avoid unwanted events or to perform a manual report of results.

➢ Press **2** key (hold pictogram)
➢ Press again **2** key to back to measurement.
➢ Quit conventional sound level meter function and back to à home screen pressing **4 key**.

8. Noise dosimeter-integrator-averager

➢ Press **2 key** from the starting screen.



The DS200 processes the sound pressure signal and displays the following informations according to the initial setting :

- the equivalent continuous level of A (A and C) weighted sound pressure for each duration of logging time – LAeq,DI and LCeq,DI
- the equivalent continuous level of A (A and C) weighted sound pressure on the current measurement duration – LAeq,T and LCeq,T
- the maximum peak level of sound pressure on each duration of logging time : LCpK
- the duration measurement in DD/HH:MM:SS

The measurement parameters will be set in advance in **"Prog.measurement"** menu. It means :

- to set the duration of logging time of the equivalent continuous level
- to select the C or Z weighting of the sound peak pressure level
- of the measurement of the A-weighted equivalent continuous level only or simultaneously with both A and C weightings
- of the activation or not of the visual alarms

2 selections of dynamic ranges are possible :

- 60-140 dBA for the measurement of sound atmospheres in a noisy industrial environment
- 40-120 dBA for the measurement of sound atmospheres in services sector or low noisy industrial environment

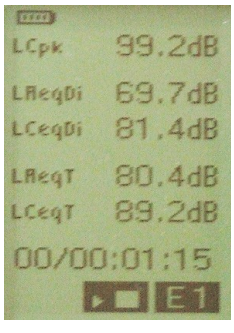
➢ Select the dynamic range pressing **1 key** according the following coding :
  - **"40"** pictogram : 40-120 dB dynamic range
  - **"60"** pictogram : 60-140 dynamic range

Note : in order to check the proper functioning of the measurement chain before launching a measurement, the screen systematically displays results each second. After the launching, these results will be displayed at the rate of the logging time.

8.1. Launch the measurement

The DS200 proposes three possibilities to launch the measurement :

- immediate mode
- delayed mode
- repetitive delayed mode



8.1.1. Immediate mode

➢ Press **2 key**.
Measurement starts immediately, results are displayed at the rate of integration duration.

8.1.2. Delayed mode

It is possible to set start and end of measurement (date-time) in case of absence.
For example : preparation of the instrument the day before the study of night-work.

➢ Press **3 key**
Programming screen is displayed.
➢ Move the cursor with **1 key** (arrow).
➢ Change the different item with **2 and 3 keys :**

- **Db** : date of measurement beginning
- **Hb** : time of measurement beginning
- **De** : date of measurement end
- **He** : time of measurement end

➢ Keep the item **Repet at 01**.
➢ Move the cursor until **Val** pictogram appears.
➢ Press **3 key** linked to this pictogram.
Programming of measurement launching is performed.

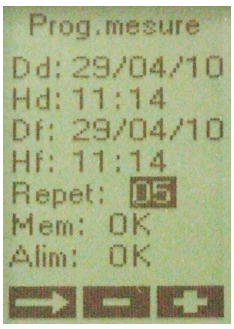
The last two lines specifies :
- that memory capacity is sufficient : **OK**
- that battery capacity allows the measurement : **OK**.

In case of incompatibility, **KO** is displayed for **OK**. In this case :
- Erase memory of the instrument.
- Load the battery.

Important note : by using the delayed mode without programming beginning date and time (current date and time always present) but by programming end date and time, measurement launches immediately when it is validated and will stop at the programmed time. This programming allows a measurement and instrument stop without being present.

8.1.3. Repetitive delayed mode

As previously, it is possible to set measurement end and beginning at moments (date-time) in case of absence and according to an established period.
For example : following of a weekly noise exposure in case of night-work



Principle : set the start and end dates of the **first measurement** then indicate the number of measurements to perform the following days at the same time.

➢ Move the cursor with **1 key (arrow)**.
➢ Set date and time of **first measurement** starting and end.
➢ Modify the item Repet : 01 indicating the required number of repetitive measurements from **02 to 05.**
➢ Move the cursor until **OK** pictogram appears.
➢ Press **3 key** linked to this pictogram.
Programming of measurement launching is performed.

The last two lines specifies :
- that memory capacity is sufficient : **OK**
- that battery capacity allows the measurement : **OK**.

In case of incompatibility, **KO** is displayed for **OK**. In this case :
- Erase memory of the instrument.
- Load the battery.

Note : about battery loading, **KO** will be displayed if and only if the residual capacity does not allow to perform the first measurement. You must load the battery before any launching of measurements and complete the loading after 3 sessions of 8 to 10 hours of measurement.

8.1.4. Delayed – Measurement wait

The principle of a delayed or free repetitive delayed measurement imposes a temporal management of the instrument which is as follows :
- programming is validated.

- waiting mode is displayed. This screen is displayed a few moment then turns off. It reactivates itself a few moment before the measurement.
- measurement is performed, data are recorded, The instrument moves to sleep mode until next measurement and so on.

Important : it is possible at any time to stop sleep or waiting mode to launch the measurement.

- In waiting mode, press **2 key**.
  The measurement starts immediately.

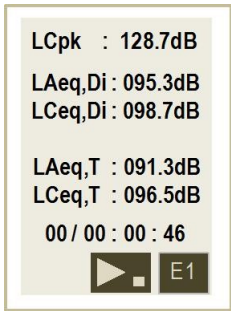
- In sleep mode, between 2 measurements, press 6 key (On/Off).
  The waiting screen is displayed.
- Press **2 key** to start the measurement.

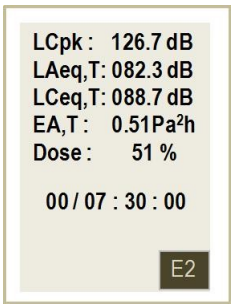
In all cases, only measurement launching is modified, end programming and daily repetitive programming are the same as the ones initially.

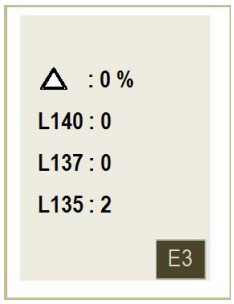
8.2. During measurement

The individual exposimeter is an instrument carried out by a person exposed to noise nuisance. Usually, the reading of the results is made at the end of the measurement. In case of control during the measurement, partial results are available.
From starting screen :

- Press **3 key** to scroll through the three screns :
  - **E1 :** general measurement screen : LCpK max, LAeq, LCeq on the DI logging time, LAeq,T, LCeq on T measurement duration
  - **E2 :** results screen : LCpk max on T measurement duration, LAeq,T, LCeq on T measurement duration, EA sound exposure on the measurement duration
  - **E3 :** screen of overload detection and peak level values (135 dB-137 dB and 140 dB)
  - **E4 :** screen of measurement setting
- Press **4 key** to back to general measurement screen





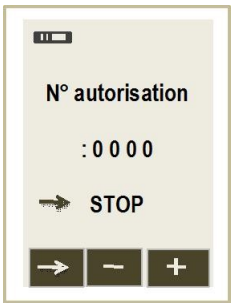


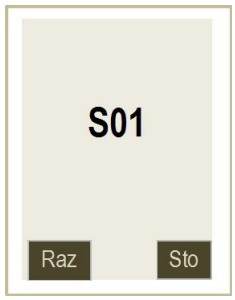
8.3. Stop the measurement and the instrument

If the measurement is manually launched, a manually stop shall be performed from the general measurement screen.

- Press **2 key**.
  *The screen of **Authorization number** is displayed to confirm the measurement stop.*
- Move the cursor on the figures number 0000 in the middle of the screen.
- Select the figures with **2 and 3 key**.
- Move the cursor on STOP arrow after the last figure.
  The measurement stops and the screen allowing to erase or store the session appears.

The authorization number is 0082.





To turn off the instrument : press a few second the 6 key until the screen shutdown.
Note : a fast press on this key turn on or off the backlight.

8.4. Data processing

At the end of the measurement, it is possible to :

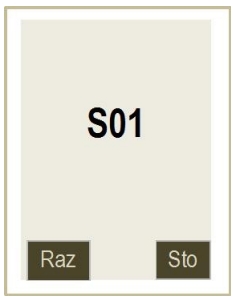
- Store data and create a session
- Reject the measurement and erase data

8.4.1. Accept data and store them

- Press once **3 key (Sto)**.
  A banner displays the storage phase.

8.4.2. Reject measurements and erase them

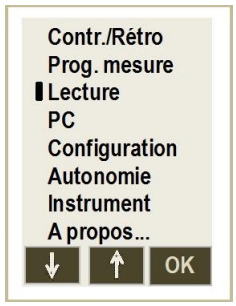
- Press twice **1 key (Raz).**
  A banner displays the data suppression phase.



Storage phase

Suppression phase

8.5. Data reading



Every measurement is stored in a micro SD under file format named sessions. Ex : S01, S02...
It is possible to read the measurement results before transfer them in a computer.
From starting screen :

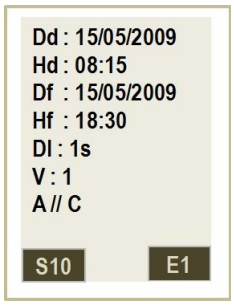
- Press **5 key**.
- Move the cursor until **Read item** with **1 or 2 key**.
- Press **3 key** to validate.
  The setting screen of the last measurement session is displayed.

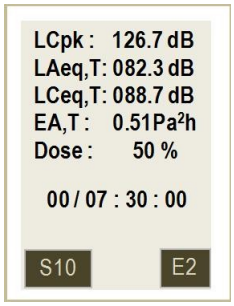
To check the others sessions, scroll through the session with **1 or 2 key** until the required session number appears.
When the required session number appears :

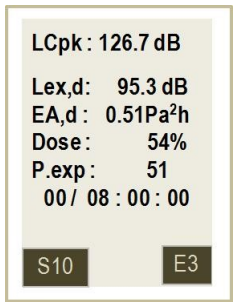
- Press **1 key**.

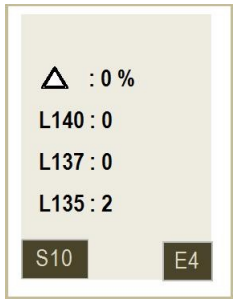
4 screens characterizes the session :

- Press **3 key to scroll through the screens :**
  - **E1 :** setting screen
  - **E2 :** results screen based on the measurement duration : LCpk max on the T duration measurement, LAeq,T, LCeq on the T duration measurement, EA sound exposure, noise dose, measurement duration.
  - **E3 :** results screen based **on the standardized duration of 08h00** : LCpk max on the T duration measurement, Lex,d daily exposure level, EA sound exposure, noise dose, exposure point*.
- Press **4 key** to back the setting screen.









Very important : results of the E3 screen are about the daily exposure level, brought to a standardized daily exposure of 8 hours from results of a T duration measurement.
This T duration must be representative of the Te effective duration of the workstation.
In this assumption, if and only if, the sound exposure values and noise dose of E3 screen are the same of the values of the E2 screen.

***Exposure point :** this number is equivalent to the hundredth of sound exposure and is used in the simplified way of the INRS in its document ED6035 available on the INRS web site.

8.6. Transfer files

This function allows to transfer data to a computer with the USB cable. The LDS23 software must be installed on the computer.

- Turn on the instrument and link it to the computer with the USB cable.
- Move the cursor to PC from starting screen with **1 or 2 key**.
- Validate with **3 key.**
  PC screen is displayed.
- Press 3 key to activate the USB connection.
  The cross on the screen disappears.

Important : when the instrument is turned off and connected to the PC, the USB connection is automatically activated. Screen **"PC"** is displayed, then a few second later the cross disappears to confirm the USB connection.

The instrument is considered by the operating system as a removable disk. So there are 2 methods to transfer file :

- with the LDS23 software (see software user manual)
- with the **"copy/paste"** or **"send to"** functions of the computer

File format : files have a specific appellation : YYYYUUUU_SXX_1203.exp with :

- YYYYUUUU : serial number of the instrument
- XX : order number from 1 to 99
- 103 : day and month
- .exp : file extension

➢ Press **4 key** twice to quit **"Transfer"** screen.

8.7. Delete files

After saving measurement dataset and transferring them to a computer, it is possible to erase the memory of the exposimeter. There are two possibilities :

- with the LDS23 software (see software user manual)
- with the instrument

With the instrument :

➢ Go to **"PC"** screen.
➢ Press **1 key (RAZ)**.
RAZ is blinking.
➢ Press **1 key (RAZ)** to confirm the deletion.
A progress bar is displayed.
➢ Quit the screen pressing **4 key.**

All the measurement dataset will be deleted.

9. Operating informations

9.1. Instantaneous overloads – Percentage

- **Instantaneous overload :** in condition of overload of input stages, a pictogram appears. It is displayed fleetingly during measurement and remains displayed during the reading of results
- **Percentage :** this information can be necessary for a measurement in the medium and long term when the overload indicator is displayed. Its presence does not provide information about the occurrence of overload but the percentage calculation provides a level of alert on measured and displayed levels by the instrument.

9.2. Power supply

This pictogram provides information on the remaining power. In case of low battery, less than one de bar on the pictogram, the instrument stops the measurement and turns off saving the current results.

9.3. Over range measurement

In measurement conditions out of the dynamic range, measured values are not displayed and are et are replaced by signs :

- **+++,+ :** if the value is higher than the top of the range : 40-120 - the top of the range 60-140 stays opened
- **---,- :** if the value is lower than the down of the range : 40 for the range 40-120 and 60 for the range 60-140.

9.4. Detection and counting of peak pressure levels 135-137 140 dB

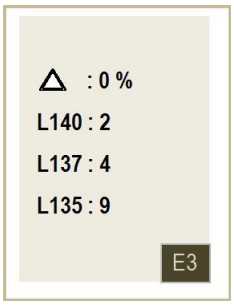
Detection principle : : the detection of peak pressure levels is made at the frequency of instrument sampling, about 23 kHz. So, theoretically, it is possible to detect several thousand of values, maximum 23 000 values per seconds.
During measurement : the instrument records the temporal evolution on an elementary duration programmable from 1 s to 60 s (usually 1 s). it displays and keeps in memory the maximum peak pressure level reached during each duration of elementary integration.
Results : the reading gives for the total measurement duration :

- on the instrument : the maximum peak pressure level reached during the measurement
- with the software : the maximum peak pressure level reached during the measurement and the maximum peak pressure level reached for each duration of elementary integration (usually 1 s).

Counting : only for **60-140 dB** measuring range. For **40-120 dB** range, counters display 0. The higher value being 123,5 dB peak.
It is limited to the number of elementary periods whom maximum peak pressure level exceeded reference values 135-137-140 dBC (Z).

This principle has the advantage to consider all the values related to the sampling rate (23 000/s possible) and simplifies the results reading and keeps the preventive and regulatory nature of this control.
The example on the right shows that during measurement, the dosimeter had recorded :

- 2 elementary periods whose maximum peak pressure level has exceeded 140 dB
- 4 elementary periods whose maximum peak pressure level has exceeded 137 dB
- 9 elementary periods whose maximum peak pressure level has exceeded 135 dB



So these results show that **during 9 DI elementary periods**, the maximum peak pressure level has exceeded 135 dB, included 4 for 137 dB and 2 for 140 dB.

9.5. Alarms

Analysis criteria of the exposure level are based on the comparisons of obtained results with those defining the lower exposure value, the higher exposure value and the the value of exposure limit. These values are regulatory requirements. The instrument considers these values, mainly for :

- the calculation of results to display
- warning during measurement the person wearing the instrument or the technician in charge of the measurement following.

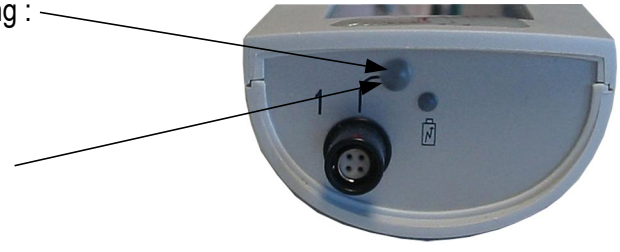
In this last case, a two-couloured light in the higher part of the housing can be activated (see page 10) for each measurement channel (V1 or V1 and V2).

Orange color : in case of at least one of the following values exceeding :

- Lpk > 135 dB C or Z
- LAeq,DI or LAeq,T > 80 dBA
- Dose > 31.62 %

Red color : in case of at least one of the following values exceeding :

- Lpk > 137 dB C or Z
- LAeq,DI or LAeq,T > 85 dBA
- Dose > 100 %



10. Maintenance

10.1. Care

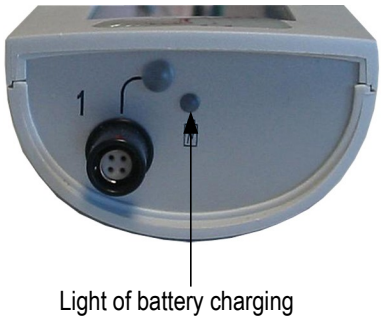
The dosimeter conception allows a reduced maintenance which consists in changing batteries and cleaning the instrument with a slightly cloth. A particular attention must be paid to the microphone sensor, which is the element the most sensitive of the metrological chain.

10.2. Regular checking

Like most measuring instruments, it is strongly recommended to regularly control and calibrate DS300 instrument. Return to the manufacturer each year will provide necessary metrological traceability.

10.3. Load the battery

- Use a USB power adaptor which serves as a charger and **ensure that the instrument is turned off.**



Light of battery charging

It is also possible to connect the instrument to a USB connection of an operating computer. The battery will load according to the available power at the USB output, about 500 mA. A 5 hours duration is necessary to get a full charge. The light situated at the top of the instrument informs as follows :

- **Red light :** load in progress
- **Green light :** completed charge
- **Orange light :**
  - the instrument stayed on during loading. Turn off the instrument.
  or
  - there is a power supply problem : return the device and its accessories to the manufacturer.

11. Preparing for measurement

To perform a good measurement, several parameters are to be considered and mainly the methodology that is deduced from the general situation. After having selected the appropriate method , it is necessary to take a few measurement precautions to get correct and significant results. Consider at least the following items :

11.1. Preparing the instrument

- Check the operating autonomy : memory, audio recording capacity and battery. Erase the memory and load the battery if necessary.
- Set the delayed or repetitive delayed start according to the selected method.
- Set the measurement parameters by keypad
- Put the microphone and its extension on the channel 1

Important : the D-MB microphone must be connected on channel 1 for a hand sound level meter use

11.2. Wearing the instrument

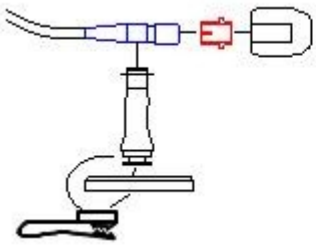
According to the observed station and to the material conditions, the instrument can be worn :

- on the person belt : use the protection cover supplied with the instrument
- on the upper pocket of the protection cloth (scrubs …) : clip the instrument in the pocket. Do not hesitate to move away the microphone from clothes thanks to its flexible neck.

11.3. Fixing the microphone

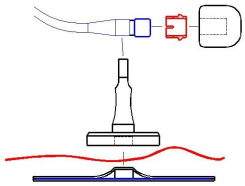
The microphone is a sensitive element, it must be positioned according to NF EN ISO 9612 : may 2009 standard recommendation.
The microphone must be mounted at about **0.04 m** above the shoulder and at **0.10 m** of the canal entrance of the most exposed ear. The cable must be slipped inside the cloth or firmly maintained with an adhesive tape in order to avoid any frictions that could disrupt measurement.
The microphone can be fixed with two different ways :

- **with the mechanical module.** This module is composed by an attachment clamp with circular base to maintain on the cloth or other accessory worn by the person (helmet,scrubs,...) and a “fork” plug of 4 cm length to clip the microphone.



Recommendations : pinch the cable through the cable guide. It minimizes the movement of the cable around the microphone.

- **With the magnetic module** which contains an imitation skin plate in which is put a magnet and a “fork” plug of 4 cm length to clip the microphone integrating in its base a magnet. The plate is put under the cloth at the level of the shoulder or any other part of the cloth. The “fork” plug becomes fixed by magnetic attraction straight of the plate over the cloth.



This is a magnetic fixing plate, do not use it on people with pacemaker or equivalent.

11.4. Using the windscreen

The windscreen is necessary to minimize the air-current effects. It comes on the the microphone with its anti-slide safety clip. In case of wear, only the foam part can be replaced :

- To remove the windscreen : take it between the thumb and the forefinger and pull hard.
- In case of calibration, remove the windscreen.

12. Technical features

12.1. Standards

The instrument meets the following standards :

- NF EN 61252 (2002) / IEC CEI 61252 (2002) / IEC CEI 61672 (2003) / IEC CEI 61260 – 1995 / A1-2001
- NF EN 61000-6-1 / NF EN 61000-6-2 / NF EN 61000-6-3 / NF EN 61000-6-4 (2001)

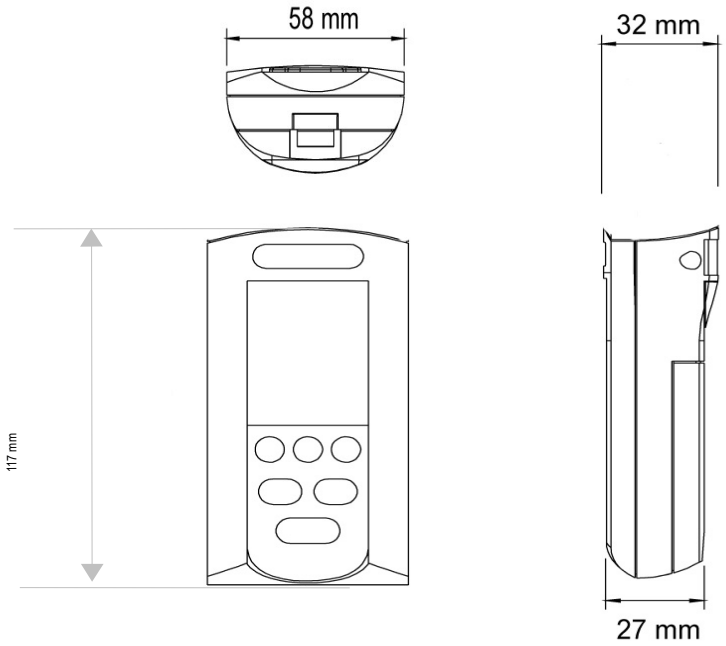
12.2. Metrology

Features	Leq and Lp channels	Peak channel
Accuracy	Class 2	Class 2
Dynamic range	40-120 dB / 60-140 dB	73-123 dB – 93-143 dB
Frequency weightings	A and C	C or Z
Values	LAF, LAS, max, min, LAeq, LCeq, Lex, d, EAT, DOSE	LCpk, LZpk
Simultaneous measurement mode	LAeq and LCeq	LCpk or LZpk
Duration of LXeq integration	From 1s to 60 s (step of 1s)	
Noise pressure sampling	23.4 kHz	24 kHz
Detection and peaks counting		135 dB – 137 dB – 140 dB
Storage capacity	99 periods of 24 hours	
Microphone	Type electret – diameter : 9.52 mm (3/8") – 10 mV/Pa	
Power supply – Battery life	Internal Li-ion battery rechargeable – Battery life > 30 hours and according to configuration	
Environmental conditions	From -10 °C to +50 °C / from 650 hPa to 1080 hPa / from 0 to 95 %HR	
Storage temperature	From 0 to +50 °C	

12.3. Charger for battery

- **Type :** universal main adapter
- **Output plug :** format USB
- **Input :** 100-240 VAC – 50/60 Hz
- **Output :** 5V DC 1000 mA (5 VA max)

12.4. Dimensions



13. Delivery and packaging

- DS200 housing with a microphone and an extension of 1m
- Carrying case with protective foam
- Adapter ring for acoustic calibrator
- Fixing kit for microphone
- Protective cover to wear on belt
- Charger
- Calibration certificate
- CD-ROM with LDS23 software and user manual

13.1. Optional and accessories

Charger and transfer station for **1 or 5** instrument : **D-S1 / D-S5**
Carrying case for 5 instruments : **D-V5**
Direct microphone **: D-MB**
Charger and transfer station for **5 instrument** : **D-S5**
Acoustic calibrator 94 dB/1000 Hz : **CAL200**
Processing software **: LDS300**

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