

INSTRUCTION MANUAL

Pistonphone

NC-72



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<http://www.rion.co.jp/english/>

Organization of This Manual

This manual describes the features and operation principles of the pistonphone NC-72. The manual contains the following sections.

Outline

Gives basic information on the unit.

NC-72 Main Unit External View

Shows an external view of the NC-72.

NC-72 Accessories External View

Shows an external view of the supplied accessories of the NC-72.

Controls and Features

Briefly identifies and explains all parts of the unit.

Operation

Describes how to insert batteries, how to make measurements and use the adapter, and reference of microphone type compensation.

Reference

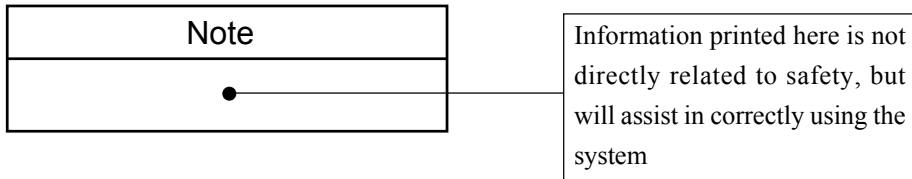
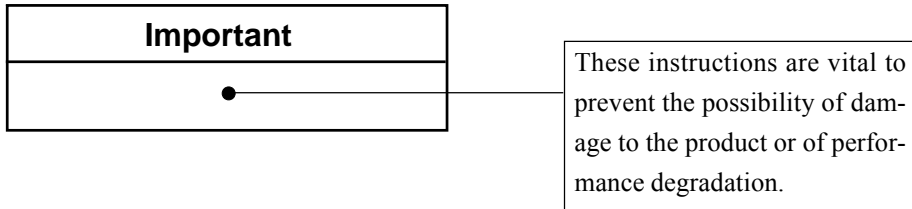
Explains output level difference according to atmospheric pressure.

Specifications

Lists the technical specifications of the unit.

FOR SAFETY

In this manual, important instructions are specially marked as shown below. To prevent the risk of damage to the unit or peripheral equipment, make sure that all instructions are fully understood and observed.



Precautions

- Read the documentation carefully, and operate the unit only as described in this manual.
- Do not use or store the unit in locations which may be
 - subject to splashes of water
 - subject to high levels of dust
 - subject to direct sunlight
 - subject to vibrations or shock
 - subject to air with high salt or sulphur content, to gases, or are in the vicinity of any substances that may adversely affect the unit
 - outside of the specified temperature and humidity range
 - subject to drastic temperature changes and to condensation
- To prevent the risk of battery fluid leakage, remove the batteries from the unit when not using it.

- This product does not require lubrication. Do not apply oil or similar to any part of the unit.
- Do not try to disassemble or modify the unit.
- In case of malfunction, contact the supplier.
- During use of the unit, sound other than the 250 Hz tone may be heard, but this does not affect performance in any way.
- The NC-72 is a precision product. Always handle it carefully and do not subject it to shocks.
- In order to maintain continued precision, have the unit checked and serviced once per year. Contact the supplier.
- When mounting and dismounting the microphone and pistonphone, do not rotate the sound level meter or pistonphone. Otherwise the protective grid of the microphone may become loose or detached, causing damage to the microphone diaphragm.

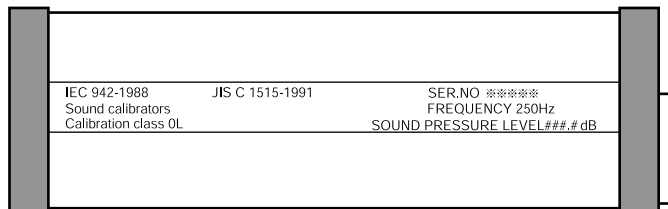
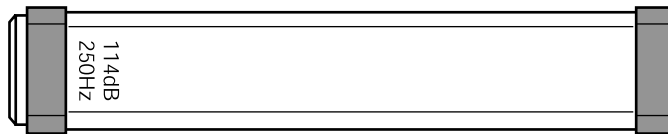
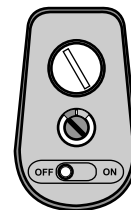
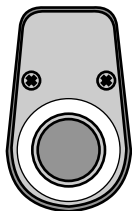
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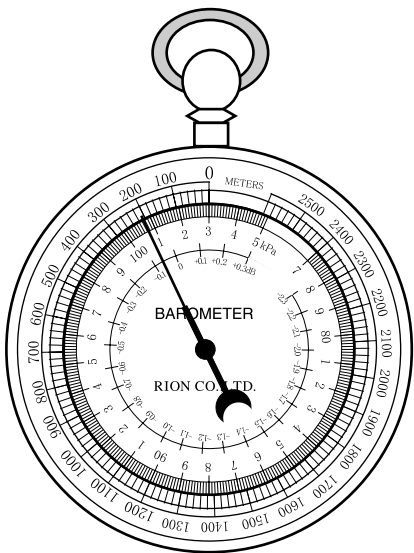
Outline

The pistonphone NC-72 is a battery-powered, easy-to-use acoustic calibrator that can handle microphones with 1 inch, 1/2 inch, and 1/4 inch nominal diameter. The unit allows calibration of sound measurement or recording systems with ± 0.15 dB accuracy. Its compact dimensions and light weight make the unit ideal for use in the field.

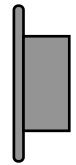
NC-72 Main Unit External View



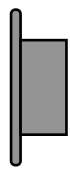
NC-72 Accessories External View



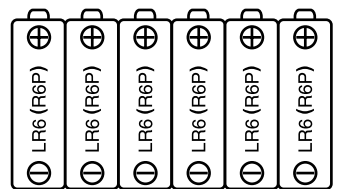
Barometer



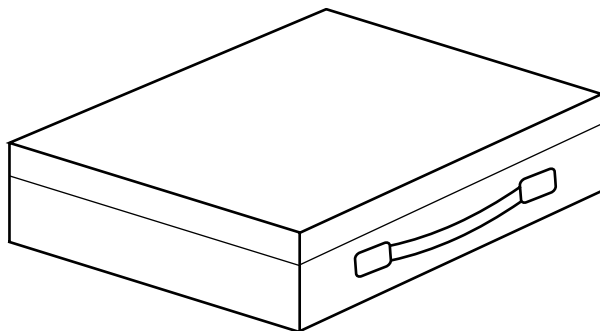
1/2 inch adapter



1/4 inch adapter



Six IEC LR6 (size AA) batteries



Carrying case



Instruction Manual (this document)

Controls and Features



Coupler section

The microphone of the sound level meter to be calibrated is inserted here.

Use the 1/2 inch or 1/4 inch adapter as required to match the microphone dimensions.

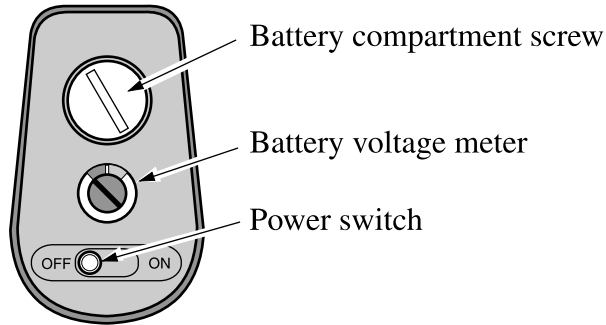
Coupler

Important

The coupler section also contains the piston part that generates sound pressure. If a foreign object enters the coupler, correct sound pressure and frequency are not assured.

- Never insert your finger, any stick, or other foreign object into the coupler.
- Take care that no conductive objects such as wire, oil, water, liquid, metal scraps, conductive plastics etc. can get into the unit.
- Protect the coupler from dust and other contamination.

Power supply section



Battery compartment screw

Turn this screw to open the cover for battery replacement.

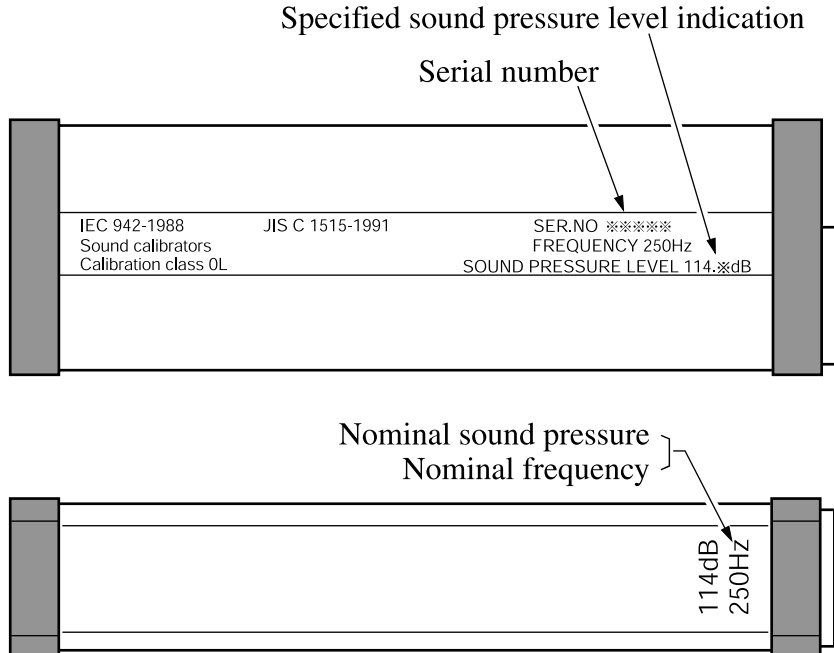
Battery voltage meter

Allows you to visually check the state of the batteries.

Power switch

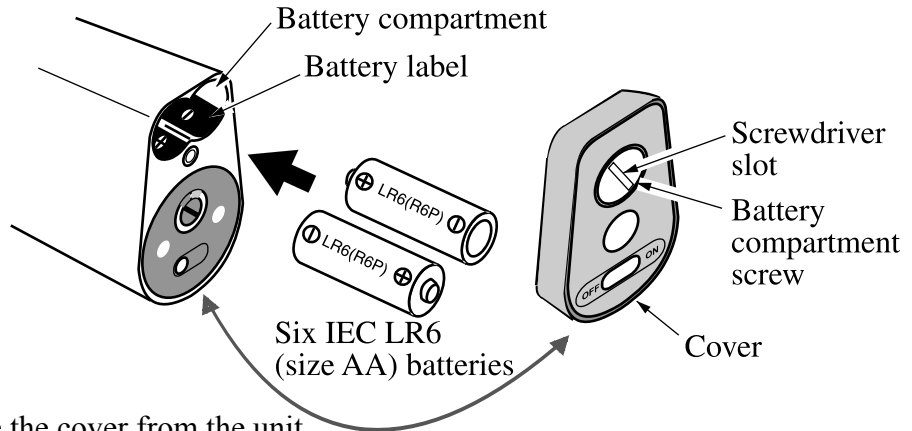
Turns the unit on and off.

Side view and top view



Operation

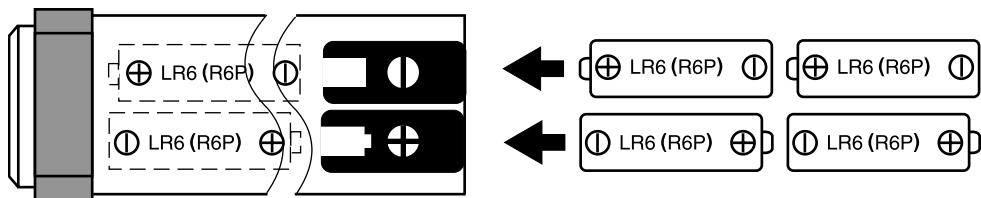
Inserting the batteries



1. Remove the cover from the unit.

Insert a flatblade screwdriver in the slot of the battery compartment screw and turn it counterclockwise to remove the cover. Take care not to turn the screw too much to prevent it from coming off.

2. Insert six fresh IEC LR6 (size AA) batteries into the battery compartment, with correct +, - orientation as shown below. The label in the battery compartment also indicates the polarity.
3. Press the cover against the unit and turn the battery compartment screw clockwise with the flatblade screwdriver until the screw is tight.



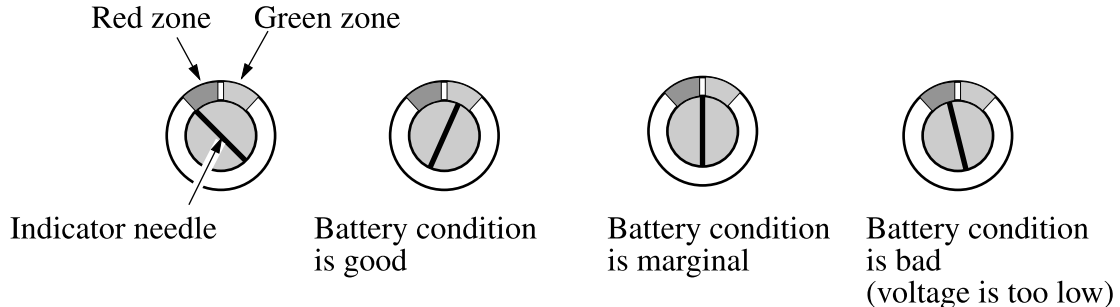
Important

- Take care to insert batteries with correct +, - orientation as shown left. (The label in the battery compartment also indicates the polarity.)
- A total of six batteries are required.
- Do not use a mixture of old and new batteries.
- Do not use a mixture of different battery types.
- To prevent the risk of battery fluid leakage that can cause corrosion and damage, be sure to remove the batteries from the unit when not using it.
- Dispose of used batteries in accordance with local laws and regulations.
- Do not attempt to charge or dismantle a battery, do not throw a battery into a fire, and do not short-circuit a battery. Otherwise fluid leakage may occur or the battery may explode.

Checking the battery voltage

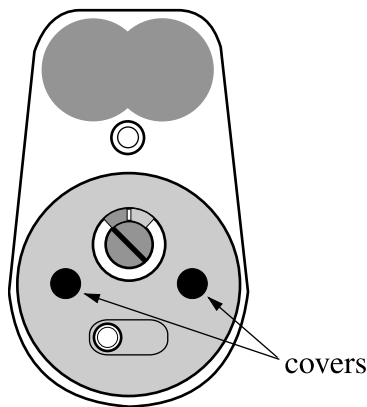
The constant sound pressure generator in the unit uses an electronically controlled motor to drive a piston and create an accurate sine wave. Frequency precision is within $\pm 1\%$ provided that the battery voltage is between 6 and 10 volts. A battery voltage meter allows the operator to monitor the state of the batteries, in order to assure correct performance.

When setting the power switch to ON, verify that the battery voltage meter indication is in the green zone.



When the indication is marginal or in the red zone, replace the batteries.
For information on how to replace the batteries, see pages 9 to 10.

Battery life at room temperature (approx. 15°C) is about 2 hours of continuous use with manganese batteries (R6P) or about 13 hours of continuous use with alkaline batteries (LR6).



Important

When the cover is removed, two small covered openings are visible. Variable resistors are located under the covers for adjustment of the unit. These controls are only for servicing or repair and should never be operated in normal use.

If the position of the controls is disturbed, frequency and battery voltage indication will no longer be correct.

When mounting and dismounting the microphone and pistonphone, do not rotate the sound level meter or pistonphone. Otherwise the protective grid of the microphone may become loose or detached, causing damage to the microphone diaphragm.

Measurement

1. Make sure that the power switches of the NC-72 and of the sound level measurement system to be calibrated are OFF.
2. Set the frequency response of the sound level measurement system to "FLAT" (or "C").
3. Select the measurement range of the sound level measurement system so that 114 dB can be measured.
4. Carefully insert the microphone of the sound level measurement system meter all the way into the coupler of the pistonphone.
 - The microphone of the sound level meter must always be inserted or removed slowly and carefully, to avoid the possibility of damage to the microphone diaphragm caused by abrupt changes in air pressure.

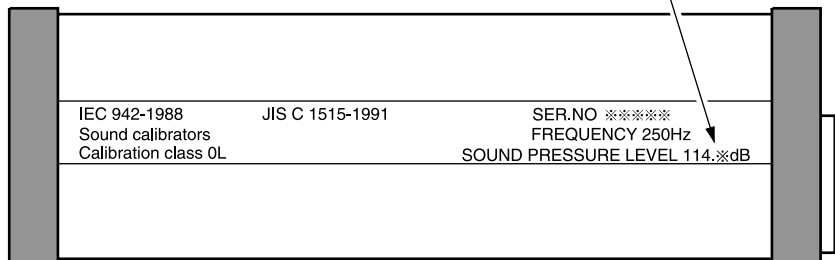
5. After inserting the microphone into the pistonphone, wait at least 1 minute.
 - If calibration is performed immediately after inserting the microphone, correct results will not be achieved due to the change in air pressure.
6. Turn power to the sound level measurement system and the pistonphone on.
7. Adjust the sound level measurement system so that the sound pressure level reading is 114 dB *.

* The precise output sound pressure level is printed on the side of the pistonphone.

At this time, compensation for the microphone type and atmospheric pressure is required.

- Microphone type calibration → page 20 to 22
- Atmospheric pressure calibration → page 23 to 26

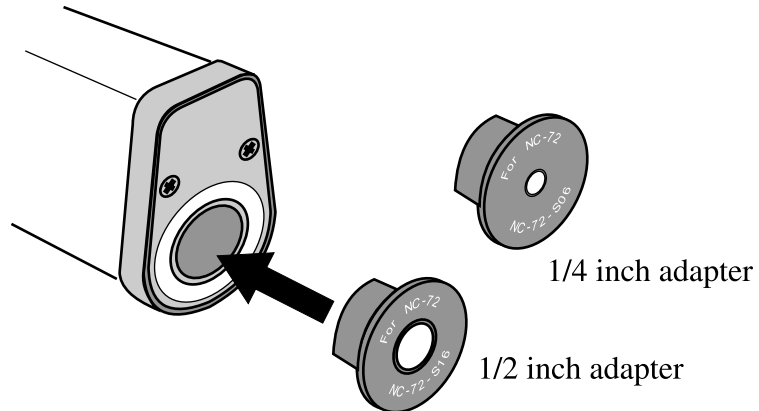
Specified sound pressure level indication



Using the microphone adapters

When the external diameter of the microphone is 1/2 inch or 1/4 inch, use the supplied 1/2 inch or 1/4 inch adapter.

- Insert the adapter fully into the coupler. Otherwise correct calibration is not possible.
- After use, be sure to remove the adapter from the coupler.



Calibration level differences according to microphone model

Microphone type adjustment

Since the pistonphone achieves calibration within the fairly small enclosed volume of the coupler, the shape and construction of the microphone's front section, especially the grid, and the equivalent volume of the membrane can lead to slight differences in sound pressure level. The difference is on the order of 0.1 dB. When using different microphones, you should perform adjustment according to the chart on the next page.

Adjustment example

When using an MR-103 and a NC-72 rated for a sound pressure level of 114.1 dB, the actually generated sound pressure level is as follows.

$$\begin{aligned} & (\text{Specified sound pressure level } 114.1 \text{ dB}) + (\text{Adjustment value } +0.2 \text{ dB}) \\ & = 114.1 + 0.2 = 114.3 \text{ dB} \end{aligned}$$

Adjustment values according to microphone model

Note

All values in the table below are for microphones with mounted grid.

Microphone model	Adjustment value dB	Remarks
UC-25	-0.1	1 inch microphone
UC-27	0.0	
UC-34	-0.1	
UC-26	0.0	1/2 inch microphone using 1/2 inch adapter
UC-28	0.0	
UC-30	0.0	
UC-31	0.0	
UC-33P	0.0	
UC-52	0.0	
UC-53A	0.0	
UC-57	-0.1	
UC-29	0.0	1/4 inch microphone using 1/4 inch adapter

Adjustment principle

Generated sound pressure level = NC-72 rated sound pressure level
+ Adjustment value

Adjustment values for other manufacturer's microphone (for reference)

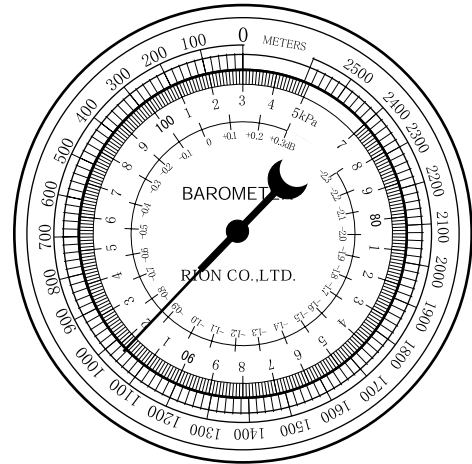
Microphone model	Adjustment value dB	Remarks
Tokyo Riko MR-103	+0.2	1 inch microphone
MR-103 without grid	+0.1	

Sound pressure level difference according to atmospheric pressure

This product comes with a barometer that allows direct readings of atmospheric pressure adjustment values in the range from 77 kPa to 105 kPa.

Place the barometer on a horizontal surface, lightly tap it with your fingertip, and read the indication when the needle has stabilized.

In the example shown at right, atmospheric pressure is 91.85 kPa, and the adjustment value as read from the innermost scale is -0.85 dB.



Note

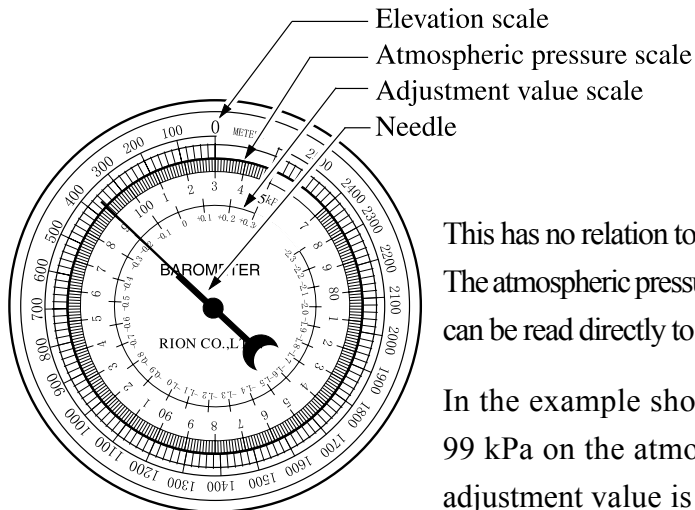
Because the atmospheric pressure adjustment value can be read directly from the barometer whose accuracy is ± 1 kPa, overall accuracy when performing adjustment with this barometer will decrease by ± 0.1 dB, and the applicable standard becomes Class 1L.

The barometer is a precision mechanical instrument. Do not tap it too forcefully, and take care not to drop it.

Additional information

As shown below, the barometer has an elevation scale, atmospheric pressure scale, and adjustment value scale.

When the measurement location was moved from a lower point to an elevated location, the elevation scale indicates by how many meters the height has increased.



By turning the outer ring so that the 0 m mark is aligned with the needle, the elevation can be read directly.

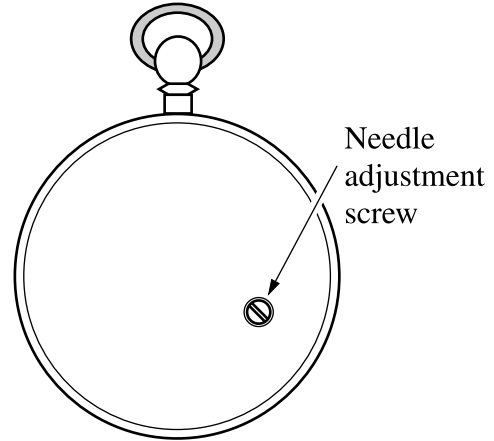
This has no relation to sound pressure level adjustment. The atmospheric pressure scale and adjustment value scale can be read directly to obtain the adjustment value.

In the example shown at left, the needle indicates 99 kPa on the atmospheric pressure scale, and the adjustment value is -0.2 dB.

The barometer is adjusted using a reference barometer before shipping (within ± 1 kPa of reference barometer).

Important

Except for servicing or repair, the needle adjustment screw on the rear of the barometer should never be moved.



Rear view of barometer

Reference

Sound pressure level difference according to atmospheric pressure

As is evident from equation 1 below, the atmospheric pressure has a certain influence on the sound pressure level p (N/m²) generated by the pistonphone.

$$p = \gamma \times P_0 \times \frac{2 \times A_p \times S}{V \times \sqrt{2}} \quad \text{Equation 1}$$

γ :	Specific heat ratio of air	1.402
P_0 :	Atmospheric pressure	Pa
S :	Piston cross section	m ²
A_p :	Cam stroke	m
V :	Coupler volume	m ³

The sound pressure level L (dB) is expressed by equation 2.

$$L = 10 \log_{10} \frac{p^2}{p_t^2} \quad \text{Equation 2}$$

p_t : Reference sound pressure 2×10^{-5} Pa

The output sound pressure level compensation value C (dB) for atmospheric pressure is expressed by equation 3.

$$C = 20 \log_{10} \frac{P_a}{P_o} \quad \text{Equation 3}$$

P_a : Atmospheric pressure at time of use kPa

P_o : Reference atmospheric pressure 101.3 kPa

Specifications

Applicable standards IEC 60942:1988, JIS C 1515:1991 Class 0L

Nominal sound pressure level

114 dB (at 1 atm)

Frequency 250 Hz \pm 1%

Distortion Max. 3%

Ambient temperature and humidity for operation

-10 to +55°C Max. 85% RH (no condensation)
When powered from alkaline batteries
(LR6)

Power supply IEC R6 (size AA) batteries \times 6

Dimensions Approx. 44 (width) \times 62 (height) \times 170 (length) mm

Weight Approx. 740 g (including batteries)

Supplied accessories	1/2 inch adapter NC-72-S16	1
	1/4 inch adapter NC-72-S06	1
	Barometer	1
	IEC LR6 (size AA) batteries	6
	Carrying case	1
	Instruction manual	1

