RION

Acoustic Power Level Measurement System for Construction Machinery

This system is designed for measuring acoustic power levels of construction machinery. The computer running the software controls the Multi-Channel Signal Analyzer SA-02 to acquire the acoustic power level L_{WA} and the 1/3 octave band acoustic power levels. Sound pressure level values are measured with the SA-02 for six measurement points arranged on a hemispheric virtual measurement surface (fixed point method), and data for levels produced when the sound source is operating are compiled by the computer. The software applies background noise correction to the measured sound pressure level of the sound source and determines the 1/3 octave band acoustic power level and the A-weighted acoustic power level.

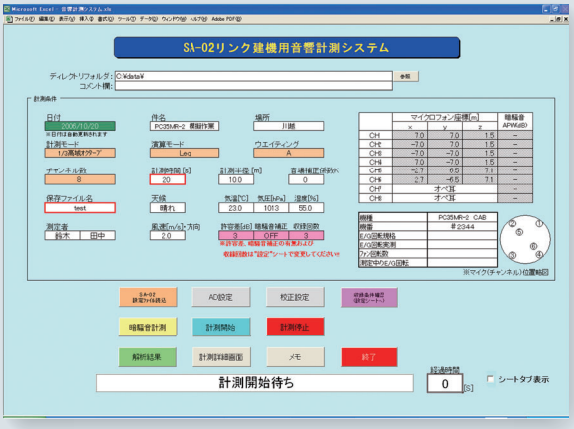
System Diagram

Equipment configuration

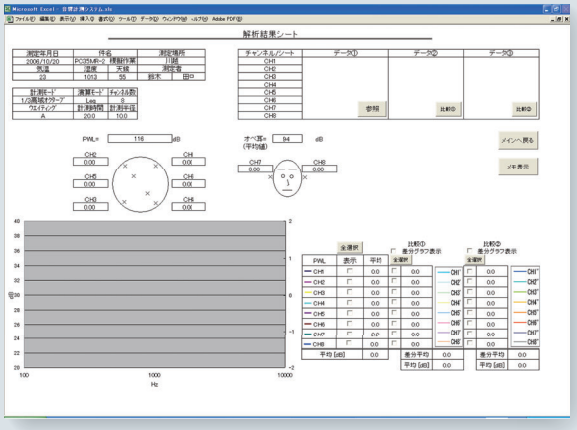
Product	Model	Quantity
Multi-Channel Signal Analyzer	SA-02M (8ch)	1
Computer for SA-02		1
Construction Machinery Acoustic Power Level Measurement System	CAT-SA02-CPWL	1
Microphone/Preamplifier	UC-52/53A/57/59+NH-22A, UC-52T/57T/59T	6/8*1
BNC-BNC coaxial cable	EC-90 series	6/8*1
Microphone stand		6/8*1

*1 Six microphones are used to measure the acoustic power level. If the noise level at the ear level of the operator is measured, eight microphones are used.

Measurement result examples



Setup and measurement screen



Measurement result screen

Application examples

Construction machinery including backhoes, bulldozers, tractor shovels, rock drills, generators, etc.

Applicable standards, reference material

ISO 6393 Earth-moving machinery - Determination of sound power level - Stationary test conditions

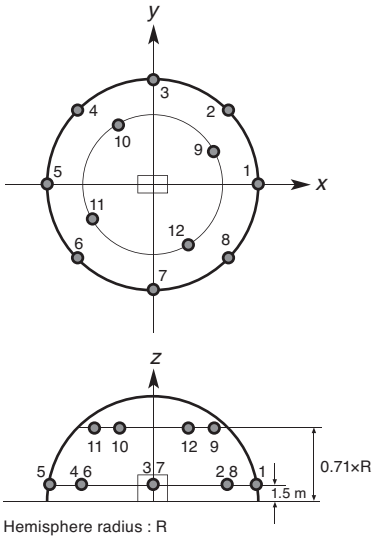
Explanation of terms

What is the acoustic power level?

Sound becomes louder the nearer the sound source, and decreases with distance (decay by distance).
Depending on the structure and design of the measurement object, there may also be certain points where sound levels are higher than at other equidistant points (directivity of sound source). The acoustic power level measurement is aimed at ascertaining the entire acoustic energy emitted by the sound source.
This allows evaluation of the sound source, regardless of decay by distance or directivity. The acoustic power level L_{WA} is calculated as follows.

$$L_{WA} = \overline{L_{Aeq,T}} - K + 10\log_{10}\left(\frac{S}{S_0}\right)$$

$\overline{L_{Aeq,T}}$	Average equivalent sound level on hemispheric measurement surface (dB)
S	Measurement area (m^2)
S_0	1 (m^2)
K	Sound field correction value (dB)



Hemisphere radius : R

Distributed by:

RION CO., LTD.
https://rion-sv.com/

3-20-41, Higashimotomachi, Kokubunji, Tokyo 185-8533, Japan
Tel: +81-42-359-7888 Fax: +81-42-359-7442

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