Metrix+™
Innovative Excellence

SOUND LEVEL METER

SL 4005

A,C & F

Measuring principle

Sound level meter measures the sound level in logarithmic scale. There is a diaphragm in the microphone which responds to changes in air pressure caused by sound waves. This sound pressure is converted into logarithmic scale and displayed.



Applications

Sound level meters are commonly used in noise pollution studies for the quantification of different kinds of noise, especially for industrial, environmental, mining and aircraft noise.

Features

- Data storage
- Built in calibration mode
- A,C & F frequency weightings
- Measuring level and time level selection

Technical Specifications

Model	SL 4005
Microphone	1/2 inch electret condenser machine
Measuring range	LP : 30 ~ 130dBA, 35 ~ 130dBC, 35 ~ 130dBF; Leq : 30 ~ 130dB; LN : 0 - 100%
Accuracy	±1dB
Frequency range	20 Hz ~ 12.5 kHz
Calibration	Built in 94dB at 1kHz(sinusoidal)
Alarm value set	30 ~ 130dB
Linearity range	50dB
Frequency weighting	A, C & F(flat)
Resolution	0.1dB
Data storage	30 groups
Time weighting selection	Fast / slow
Sampling frequency	2 times / sec
Power	1.5V AAA batteries
Size and weight	236 x 63 x 26mm, 170g
Standard accessories	Main unit, manual, battery, hard carry case
Optional accessories	PC interface

Understanding basic sound level measurement concepts

Sound is a phenomenon caused by fluctuations in air pressure. Even at same amount of pressure fluctuations, we, humans do not feel they are the same at different frequencies. Hence, to evaluate the loudness as perceived by human ear, it is important to consider auditory sensations and its characteristics.

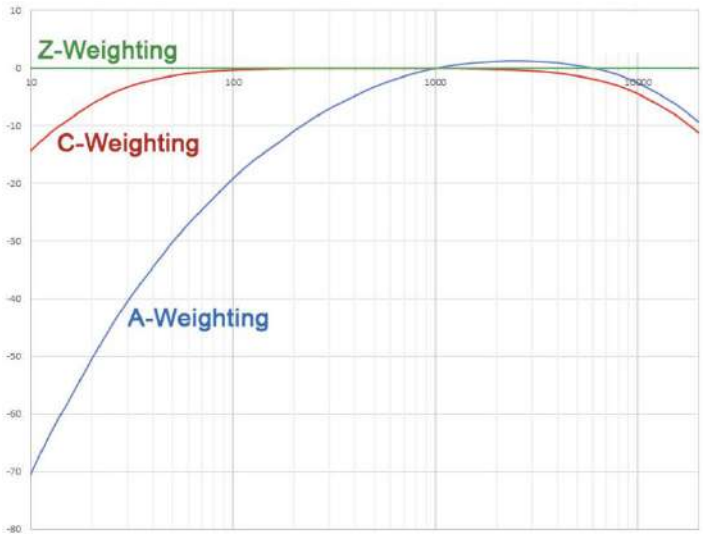
Frequency weightings:

Our ears are most sensitive to frequencies between 500Hz and 6kHz and are less sensitive to frequencies above and below these. For a sound level meter to measure and report noise levels that represent what we hear, frequency weightings are used.

'A' frequency weighting – A Weighting is the most commonly used and covers the full frequency range of 20Hz all the way up to 20 kHz. It adjusts the readings to reflect the sensitivity of the human ear. At lower and higher frequencies, the human ear is not very sensitive whilst being more sensitive between 500 Hz and 6 kHz. This is the most commonly used weighting to understand effect of sound level on human ears.

'C' frequency weighting – At higher sound levels (volumes), our ears have a flatter response, and this C weighting is used to represent that, giving much more emphasis to low frequency sounds. This is commonly used for peak sound pressure level.

'Z' frequency weighting – 'Linear' weighting is similar to Z frequency weighting, which represents a flat frequency response(no filters) to the entire frequency measuring range. It is used where analysis of the sound source is required rather than the effect the sound has on humans, such as in testing the frequency response of produced loudspeakers in a manufacturing process.



Time averaging:

Time averaging is used to analyze signals with a need to reduce the impact of short term fluctuations. The idea is to compute an average of signal over a specified time period to get smoother representation of the signal.

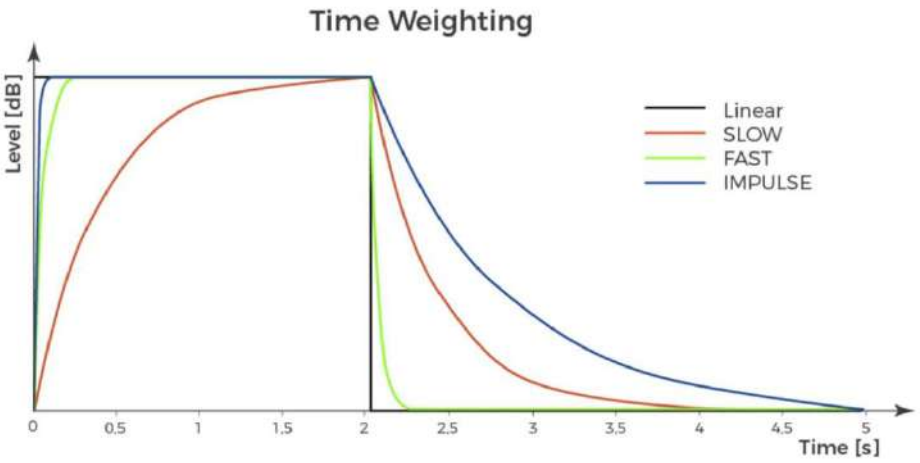
Linear time average – This method averages the signal value over a fixed time window, treating all data in the window equally.

Exponential time average – This method averages the signal value over a fixed time window, giving more weight to recent data, to react faster to signal changes. This is much more common as sound level meters are generally required to measure near to real time changes in noise levels.

Time weighting:

Time weighting refers to exponential time averaging method, where the instrument's sensitivity to fluctuating sound level is adjusted as per the required response.

Slow(S) time weight – With a time constant of 1s, this is slow reacting, used for rapidly changing sound levels.
Fast(F) time weight – With a time constant of 125ms, this is fast reacting, used for sound levels, which do not change rapidly.
Impulse(I) time weight – Specifically designed for measuring sounds with sharp peaks (like gunshots, fireworks), intended for measuring short impulse sound signals. It reacts very quickly to sharp rising sound level signal, while decays slowly to level drops.



Common metrics:

Leq – Equivalent Continuous sound pressure level. This represents the average rms value of sound level over a specified period of time, amounting to the same total sound energy as the source. This is a key metric to understand the total sound energy produced by a fluctuating source within a specified time period.
Lp – Instantaneous sound pressure level generated by the source.
Lmax – Maximum sound level over a specified period of time.
Ln – Percent of sound level over a specified alarm value.

Octave Bands:

Octave bands offer a filtering method of splitting the audible spectrum into smaller segments called octaves, allowing you to identify different noise levels across individual frequencies. This is useful in noise reduction and control, hearing protection, machinery testing, environmental noise issues, etc.

1/1 Octave Band: 1/1 Octave Band measurements are used when the frequency composition of a sound field is needed to be determined. The common octave frequency bands are: 31.5hz → 63Hz → 125Hz → 250Hz → 500Hz → 1.0khz → 2.0khz → 4.0khz → 8.0khz → 16KHz, and their composition is made up of the Lower Band Limit, Centre Frequency and Upper Band Limit.

1/3 Octave Band: Each 1/1 (single) Octave is further split into three, providing a more detailed view of noise content. 1/3 Octave Bands provide a further in-depth outlook on noise levels across the frequency composition. The bands are: 20Hz → 25Hz → 31.5hz → 40Hz → 50Hz → 63Hz → 80Hz → 100Hz → 125Hz → 160hz → 200Hz → 250Hz → 315hz → 400Hz → 500Hz → 630hz → 800Hz → 1.0khz → 1.25khz → 1.6kHz → 2.0khz → 2.5KHz → 3.15khz → 4.0khz → 5.0khz → 6.3khz → 8.0khz → 10kHz → 12.5khz → 16KHz → 20kHz.

Our range of Sound Level Meters for easier selection process

Model → Features ↓	SL 4005	SL 4005A	IMSL 4005	INSL 4005	IISL 4005	NSA 01
Regular	√					
Highly accurate (as per int'l standards)		√	√	√	√	√
Impulse			√		√	√
Integrating				√	√	√
Octave bands (1/1 & 1/3)						√
Data Output	√			√	√	√
Printer				√	√	√

**Integrating feature allows the meter to record 800 groups of measurement or 6 days of data(hourly) with statistics of each group like 5, 10, 90 percentiles, std deviation, day or day/ night equivalent sound level, etc.*
**Data output (PC interface, Bluetooth) and Printer are optional accessories to be purchased separately*

Model and Specifications subject to change without notice.