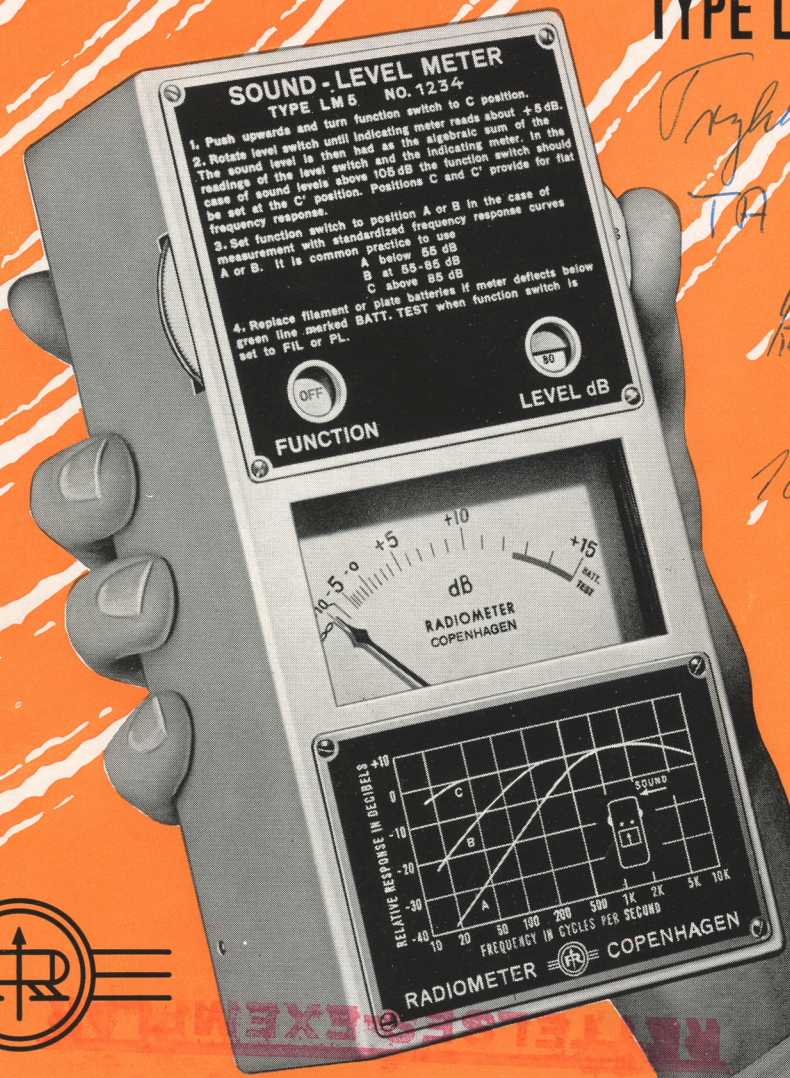
18004 A

SOUND-LEVEL METER

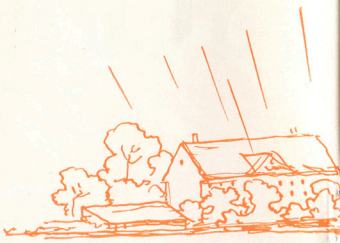
TYPE LM5



RADIOMETER

COPENHAGEN NV · DENMARK

SOUND-LEVEL METER



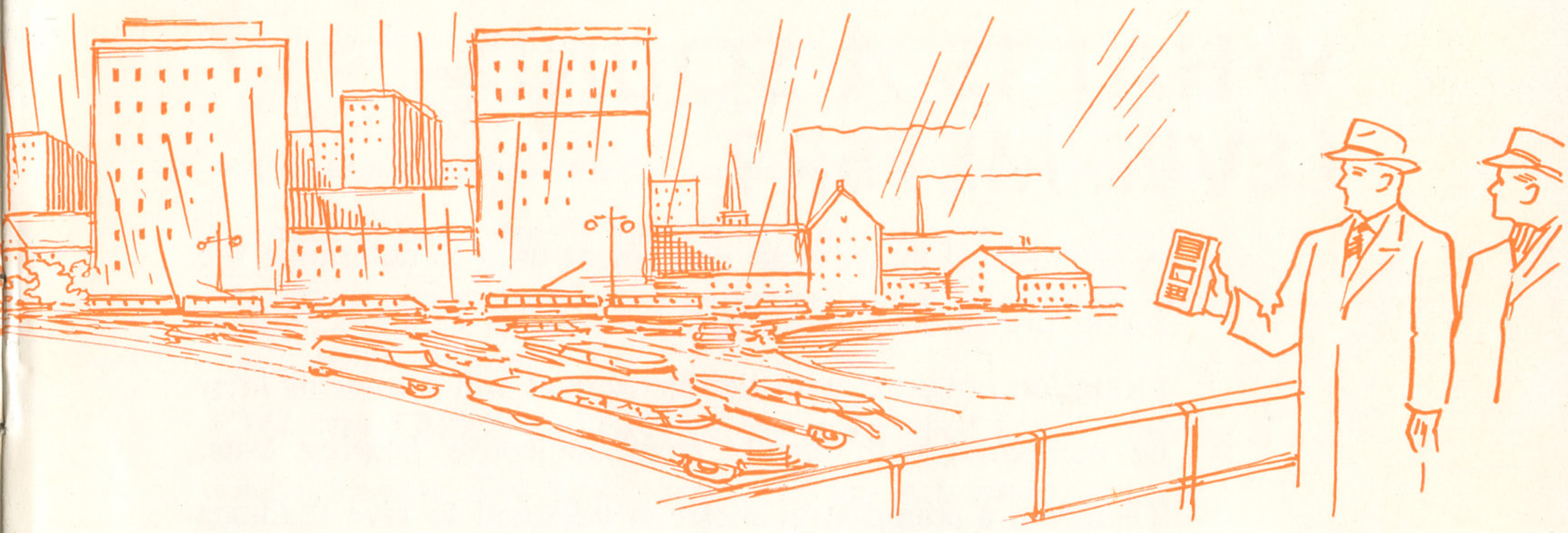
The Sound-Level Meter type LM5 is a small and versatile instrument with a high accuracy. It can be used for almost any kind of sound-level and noise measurement when a detailed frequency analysis is not necessary. It weighs little more than 1 kilo and is completely self-contained.

The Sound-Level Meter has found wide application, e. g. it is used by:

- production engineers to estimate the nuissance from machinery in factories and offices
- traffic autorithies to trace noisy vehicles
- consultant engineers and sales engineers to determine sound-levels in theaters, cinemas, public address systems, etc., and to estimate the necessity of reducing the noise
- physicians to get a preliminary judgment of hearing loss and to estimate the possibility of long-time effect on hearing a high sound pressures.

DESCRIPTION

The Sound-Level Meter incorporates a sensitive crystal microphone, a calibrated ladder attenuator, a 4-stage amplifier using negative feedback, and a large indicating meter with a 65 mm scale. A filter network provides for 3 different frequency responses. The curves obtained meet the requirements of the A, B, and C curves specified by the American Standards Association. In a fourth position, C', a flat frequency response is obtained with an attenuation of 30 dB. The readings on the level attenuator are automatically



changed by means of a screen when the instrument is switched from C to C'.

The meter is calibrated from –10 to +15 dB, and 0 dB is at about $^1/_5$ of full deflection. The level attenuator has steps of 10 dB. Zero readings can be had at sound levels between 40 dB and 90 dB in the A, B, and C position. Consequently sound levels between 30 dB and 105 dB can be measured. In the C' position sound levels up to 135 dB can be measured. The attenuator can be operated conveniently with the thumb when the instrument is held in one hand.

The built-in batteries are of common type, and the battery life is more than 40 hours of intermittent operation. The battery voltages can be checked in two positions of the frequency response selector, which is automatically locked in position OFF to prevent unintended switching on of the instrument. It can be operated only when the attenuator selector is in a separate position, START.

The Sound-Level Meter is provided with a $^3/_{16}$" threaded hole for mounting on tripod.

WHAT IS A SOUND-LEVEL METER?

A sound-level meter is an instrument used to determine the sound pressure to which a human ear is exposed. All information obtained with the instrument will sooner or later be compared with results from subjective hearing tests. Therefore a sound-level meter is designed to give readings which as far as possible are comparable with the subjective impressions.

The human ear is sensitive to the magnitude of the sound pressure (the Loudness) and to the frequency (the Pitch). At a constant frequency the loudness sensation is approximately logarithmic, i. e. the doubling up of a sound pressure always seems to add the same amount to the loudness impression. Therefore the sound-level is most often measured in a logarithmic unit, the decibel. The sound-level in decibel (or dB) is defined as:

$$SL\ (dB) = 20 \log \frac{P}{P_0}$$

P being the actual sound pressure and P_0 the reference sound pressure 0.0002 dyne/cm^2.

While the sound pressure is constant, the loudness impression varies with the frequency. At low sound pressures the low-frequency sounds give a lower loudness sensation than the higher frequency sounds. At high sound pressures this difference decreases, and finally it disappears. This phenom-

enon is illustrated by the equal-loudness contours shown in fig. 1. These curves have been plotted from mean values of a great number of young people. At 1000 cps the loudness sensation is arbitrarily said to be truly logarithmic, and the loudness sensation of each pure tone is compared with that of a 1000 cps tone.

The type LM5 Sound-Level Meter is designed to meet these requirements. The meter scale and the step attenuator are calibrated in decibels re 0.0002 dyne/cm², and the sound pressure is the sum of the two readings. The frequency dependent sensitivity found at low sound pressures is imitated by a frequency weigthing network with 3 positions corresponding to the equal-loudness contours 40, 70, and 100 dB. This weighting network follows the directions of the American Standards Association. By means of the

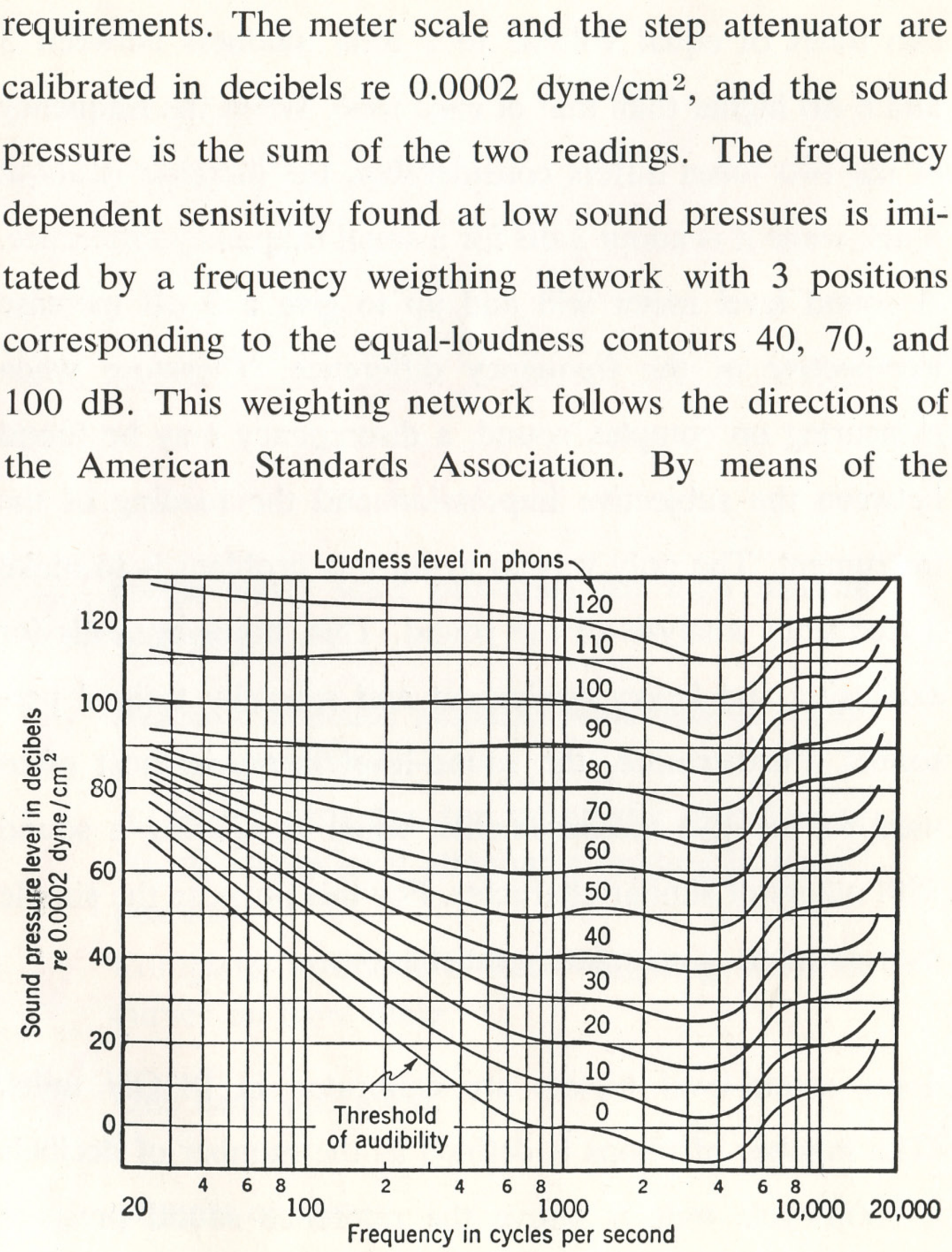


Fig. 1.

3 positions any of the equal-loudness contours can be sufficiently imitated.

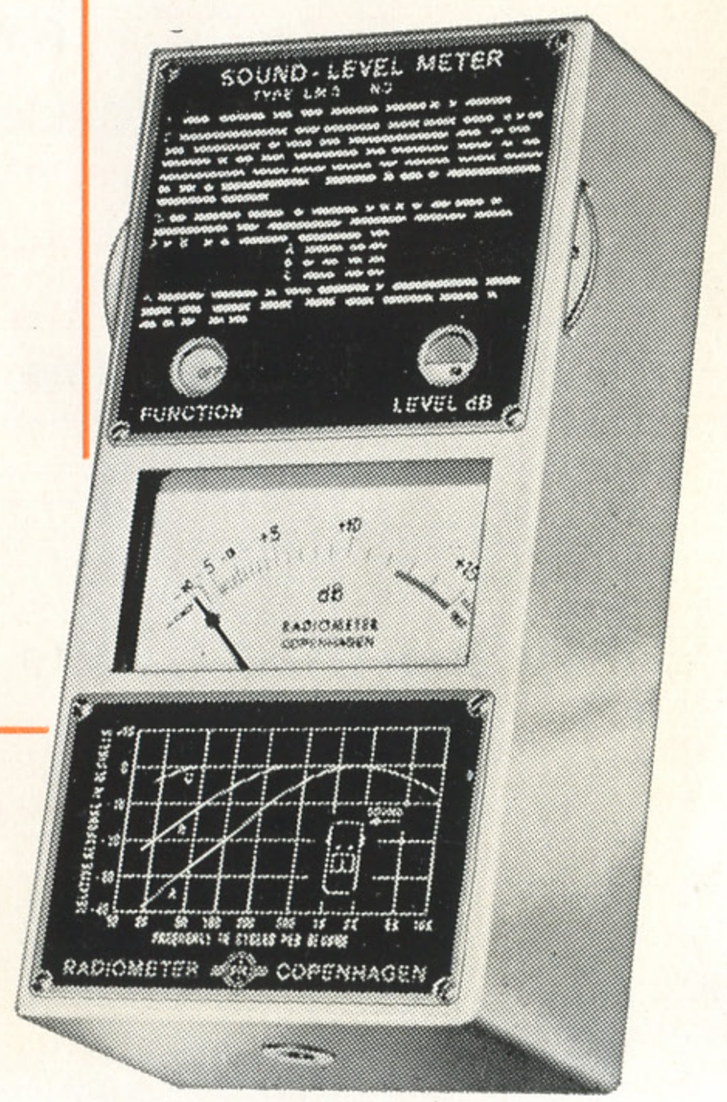
One property of the human ear, however, is not imitated by our sound-level meter, nor by any other instrument of similar size. When the sound consists of more than one frequency, the ear adds up the different components in a rather complex way. Generally, however, it can be said that the ear adds up two tones of equal volume to a total loudness between 3 and 6 dB higher than that of each tone. When the frequency of the two tones differs considerably, the increase is about 6 dB, while it is about 3 dB for a small frequency difference. A sound level meter will add up to give a 3 dB increase irrespective of the frequency difference. Therefore when measuring on complex sound, a discrepancy may be found between the subjective impression and the reading of the instrument. The only way to avoid this problem is to make a frequency analysis of the sound. This, however, calls for expensive and heavy equipment and specially trained personnel. Furthermore, the sound-level meter is most often used for relative measurements, when comparing a sound with others of similar character. For this purpose the simple measurement is completely satisfactory.

Some sound-level meters are calibrated in PHON units. (The number of phons is defined as the number of decibels a 1000-cycle tone is above the reference sound pressure when judged equal in loudness to the tone in question).

The suitability of the notion phon, however, is disputed in many countries, and therefore we have followed the neutral practice of calibrating in decibels. When the weighting networks are used according to the directions, the decibel readings of the type LM5 are identical with the readings of an instrument calibrated in phons.

FEATURES

- ✓ Large meter scale providing for high reading accuracy.
- ✓ Negative feedback amplifier with reliable standard components.
- ✓ A screen provides for automatic addition of 30 dB to the level attenuator reading in the C' position.
- ✓ Complete instructions and weighting network curves on front plate.
- ✓ One hand operation.
- ✓ Mounts on tripod.



SPECIFICATIONS

MEASURING RANGE: 30 dB to 135 dB above $2 \cdot 10^{-4}$ dyne/cm^2. The result is alvays obtained by adding up the readings of the meter and the attenuator.

INDICATING METER: Scale length: 65 mm, calibrated from –10 to +15 db. 0 dB at about $^1/_5$ of full deflection.

ATTENUATOR DIAL: From 40 to 120 dB in steps of 10 dB.

FREQUENCY CHARACTERISTICS: Comply essentially with the requirements of the American Standards Association. Curve A follows the 40 dB equal loudness contour. Curve B follows the 70 dB equal loudness contour, and curve C is flat. At measurements above 105 dB, only curve C and be used.

ACCURACY: The amplification is adjusted at 1000 cps to within 1 dB. The three frequency responses are within the limits given by the ASA.

STABILITY: The amplifier is stabilized with about 10 dB feedback. The change in gain with battery voltages is within 0.3 dB. The performance of the instrument is practically unaffected by change in temperature. In the range –10° C to +30° C the error due to variations in temperature is less than 1 dB for frequencies above 50 cps.
In order to avoid damage to the microphone the instrument must not be exposed to temperatures higher than 50° C.

BATTERIES: One 1.5 V, 29∅×49 mm, e. g. Hellesen type "Uncle".
Two 22.5 V, 15×25×50 mm, e. g. Hellesen "Atomax" type 10122.

WEIGTH: 1050 grams (inclusive of batteries)

DIMENSIONS: Height: 60 mm
Width: 94 »
Depth: 193 »

FINISH: Gray hammer lacquer

EXTRA ACCESSORY: Leather case

Dealers name:

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