



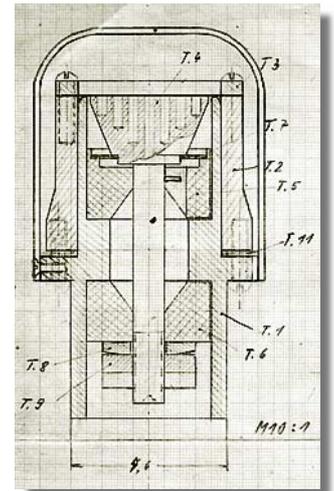
## Calibration Microphones MM 2, MM 3, MM 5

As an audio pioneer, Neumann is constantly charting new territory. In the early years, when microphone production was still in its infancy, new problems were encountered at nearly every turn. For example, how can a thin diaphragm be produced from plastic? Neumann solved this particular problem by heating the plastic and pouring a controlled amount onto the surface of water.

For the very first microphone amplifiers, resistors were fashioned from thin bars of graphite. Acoustic measuring devices hardly existed. So Neumann developed the first practical logarithmic level recorder. For the absolute calibration of pressure microphones, Neumann designed a pistonphone. In the best pioneering tradition, Neumann used these devices as indispensable tools and aids for exploring the frontiers of acoustic research and the realization of innovative ideas.

The industry also lacked a calibration standard for the acoustic testing of microphones. In 1949 Neumann developed a miniature microphone capsule that functioned as a pressure transducer. The aluminum membrane measures 10 mm in diameter. To prevent disturbing the sound field in the calibration room by the relatively large microphone amplifier, the capsule assembly is separated from the amplifier housing with electrical connection running through a thin tube of 25 cm length. The amplifier is modified from the U 47, with the same tube model VF 14 M.

The calibration microphone features a linear frequency range of 20-16,000 Hz, with a maximum deviation of +/- 1 dB. Neumann used the calibration microphone in conjunction with two Neumann P2 level recorders for quality control of its own microphone production. The combination of the calibration microphone with one level recorder served to maintain a constant sound pressure level in the calibration room, independent of the frequency. The second level recorder monitored the output voltage of the microphone under investigation.



The MM 2 was succeeded in 1954 by the MM 3, which had the same specifications, but was equipped with the AC 701(k) tube in place of the VF 14 M.

For detecting higher frequencies up to 50 kHz – for example, when testing acoustic models in reduced scale – Neumann developed an even smaller capsule with a Nickel diaphragm, known as the MM 5. Introduced in 1955, the MM 5's frequency response up to 20 kHz is as consistent as that of the MM 2 and MM 3. In the 20 kHz to 50 kHz range, the tolerance is less than 3 dB. These close tolerances were regularly checked in cooperation with the Natural Metrology Institute in Braunschweig, (now Physikalisch Technische Bundesanstalt, the German equivalent of National Bureau of Standards).



Just as Neumann level recorders were standard equipment in most acoustic calibration laboratories of the time, Neumann calibration microphones served for decades as the standard for nearly all manufacturers of microphones and loudspeakers. Calibration microphones continued to be produced until the early 1970s. Today, almost thirty years later, many of them are still in service.

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