



KM 64 - The Cardioid

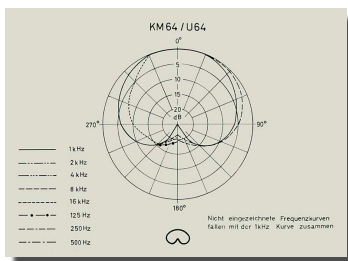
During the 1950's and 60's the use of multiple microphones became increasingly common. Ever more microphones were being used simultaneously for the same recording session. While the different sections of an orchestra perform close to each other, microphones for the brass section, for example, often also pick up the sounds of the neighbouring woodwinds arriving from a different angle. The reverse, of course, is equally true. Unfortunately, the frequency response of a traditional cardioid microphone is not the same for all directions of sound incidence.

The spectrum of the woodwinds' microphone may be significantly different from the crosstalk of this section picked up by the neighbouring section's microphone. The solution would be a cardioid microphone with a frequency response unaffected across the largest possible angle of sound incidence. Neumann took up the challenge to develop such a transducer, for which Neumann was issued patent number 14 37 420.



To achieve this unidirectional pattern, it is necessary that the sound impinging on the microphone from behind reaches the points at center-front and center-back of the diaphragm with the same amplitude and phase. Theoretically, it would suffice if the sum of the positive and negative diaphragm movements were zero, and the diaphragm does not necessarily have to remain still. In practice, however, useful results are achieved only when the proper phase and amplitude conditions are fulfilled across the entire diaphragm, allowing it to remain stationary at all points.

This problem had not been solved yet in the construction of contemporary miniature microphones. The back electrodes commonly used at the time feature a large number of holes that allow sound from the rear to pass directly to the back side of the diaphragm. The distance between the diaphragm and back electrode is typically about 40 fm. The diaphragm is thus stimulated practically point-by-point through the holes. This led Neumann to re-engineer the



back electrode with only nine holes, connected by three comparatively deep slits, intersecting the nine holes. With this novel rear electrode the distance from the sound exit vents to the back side of the diaphragm measured more than 2000 μm , rather than the traditional 40 μm . Sound from the rear would thus expose a larger area on the back side of the diaphragm instead of just striking multiple individual points.

Using the newly designed back electrode, the stimulation of the diaphragm's back side corresponds for the most part that of the front side, and the design goal of achieving equal phase and amplitude levels on both sides of the diaphragm is almost perfectly achieved. The result is the KM 64 miniature microphone capsule – with its nearly ideal cardioid pattern – introduced in 1964.



The frequency response for a sound incidence angle of 135° is nearly parallel to the on-axis response. At this angle the rejection stays at a virtually constant 15 dB between 100 Hz and 18 kHz. With such a microphone sound events occurring in a three-quarter circle around the microphone can be recorded, registering only differences in loudness without any sonic coloration. Besides multi-microphone recordings, practical applications include talents changing their position on stage during a recording, or recording a conversation between people in different locations, for example during field reports and roundtable interviews.

The KM 64 is equipped with a Telefunken Triode of the type AC 701 K. The KM 64's features and connections correspond to that of the other miniature microphones KM 53/54/56 and the accessories of these microphones can be shared.