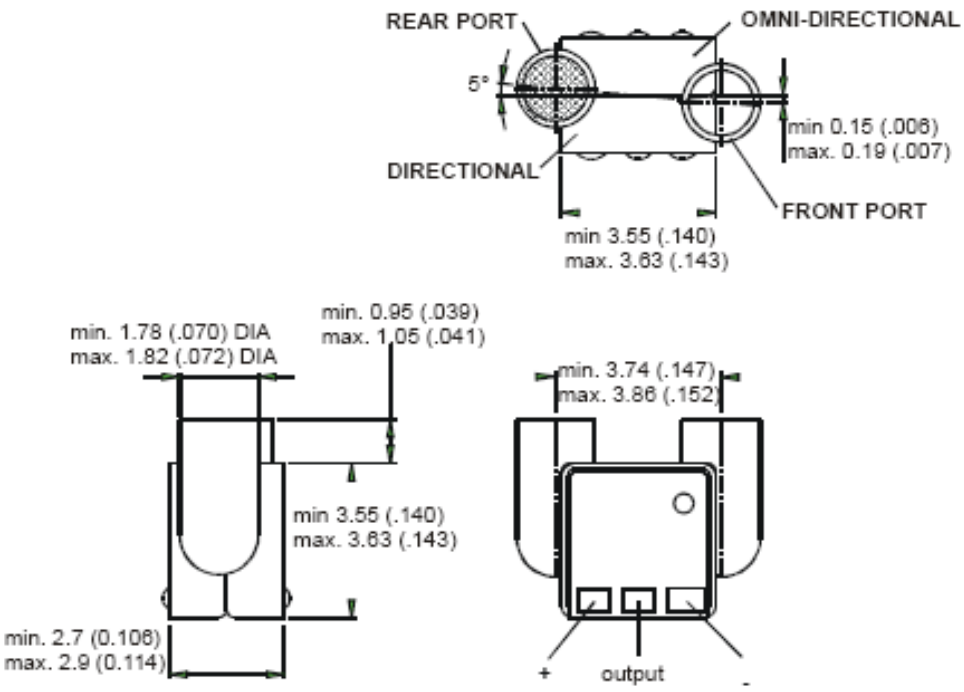
Application Note

CC-MIC

CC-MIC: model number: 6950
Free field null angle: 103°
Typical null angle on the manikin: 113°



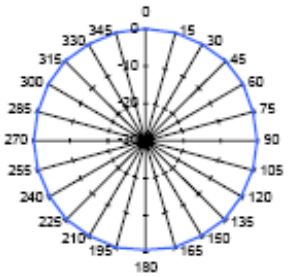
Definitions

The output of a directional microphone is proportional to the phase difference between two acoustic signals.1 For the CC-MIC the subtraction of the two acoustic signals takes place at the diaphragm.

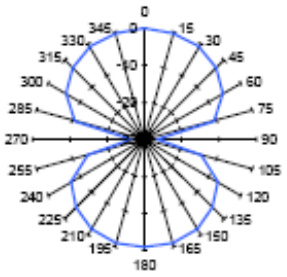
Different directional characteristics such as cardioid or hypercardioid responses can be obtained by changing internal delay time of the directional microphone. Figure 2 shows different polar plots.

The best polar response depends on a listening situation. If an unwanted sound is right behind the hearing instrument user, a cardioid response will perform best to reduce the noise from behind. However, when the user finds himself in a 'cocktail party' situation where the background noise is equally strong from all directions, then a response in between the supercardioid and hypercardioid response is best suited.

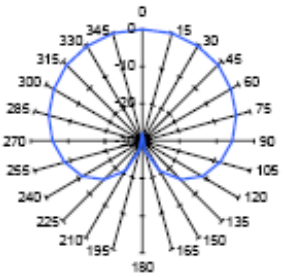
The CC-MIC has been designed to have a response in between supercardioid and hypercardioid response, because it has the highest average attenuation of noise sources over all angles of incidence.



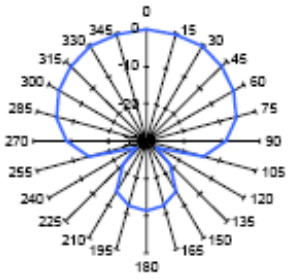
Omni-directional



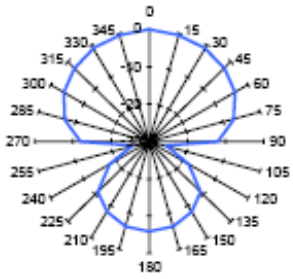
Bi-directional



Cardioid



Supercardioid



Hypercardioid

Figure 2. Different Polar directivity patterns. The attenuation is expressed in dB relative to the 0°-output level.

To obtain a supercardioid polar response measured on a manikin, the resulting horizontal polar characteristic should have a null angle in the range of 110-120°. Using suitably tuned microphones this will result in DI values in the 4.5 to 6 dB range and 0° relative to 180° sensitivity differences of about 6 dB.

The 110-120° null angle translates to a null angle of 103° when the microphone is measured under anechoic conditions without a manikin. For that reason the CC-MIC is specified with a typical null angle of 103°. The difference in null angles between in the ear and free field can be attributed to an apparent slowing down of sound waves as they pass by the head obstacle.

Omni-directional microphone

An omni-directional microphone is included in the CC-MIC package. This results in a very easy to mount complete unit.

Figure 3 shows the frequency response of the omni-directional microphone and directional microphone which are part of the CC-MIC. The figure shows that the maximum sensitivity of both microphones are very close to each other. This results in a very similar headroom of the amplifier when the omni-directional microphone and directional microphone are used.

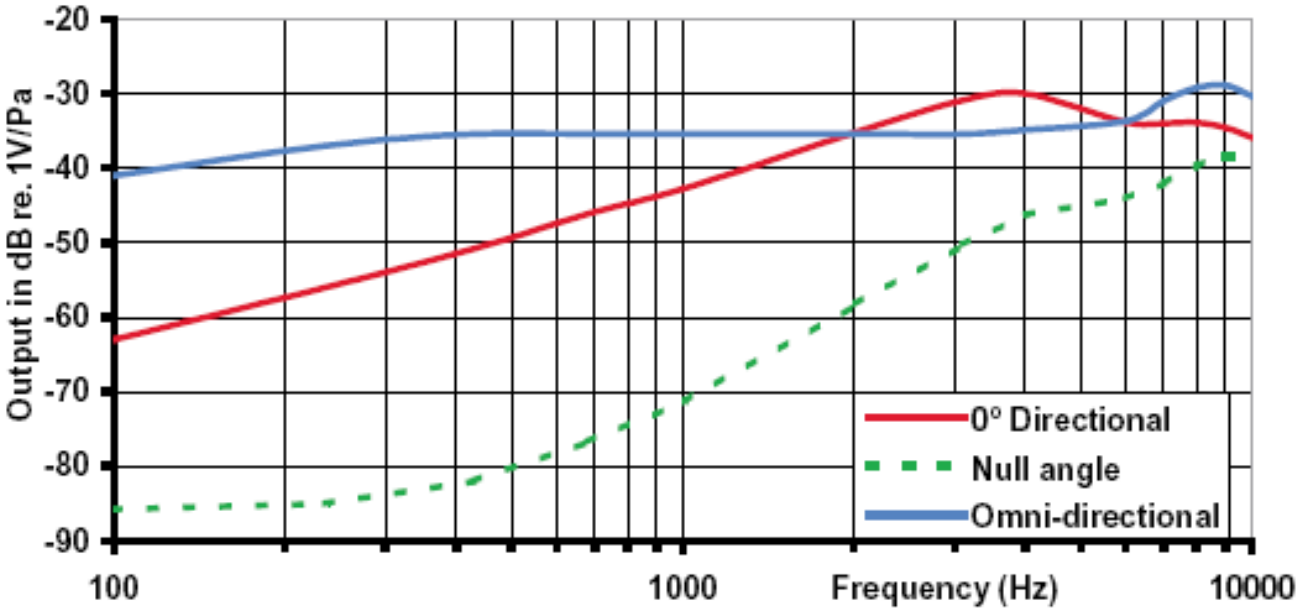


Figure 3. Frequency response.

Mounting

Earmold impression

It is highly recommended that the dispensor marks the horizontal plane of the earmold. This may be achieved by inserting a plastic paper clip into the impression. Since ears vary it is difficult to determine from the impression alone how to align the capsule for maximum directivity. Errors of up to +/-10° are tolerable, but the optimum directivity pattern can be achieved by knowing how the hearing aid will sit in the ear relative to the horizontal plane.

Faceplate design

The port distance of the CC-MIC products is typical 3.8mm.

The outside diameter of the spouts have a typical value of 1.8mm.

Therefore on a distance of 3.8mm two holes with diameter 1.8mm has to be drilled in the faceplate. Keep the microphone sound ports covered during assembly. The sound port that contains grid should be orientated to the back. A droplet of cyanoacrylate (Loctite 416 or Silicon Mastic: Loctite 5088) can be used to secure the microphone to the faceplate.

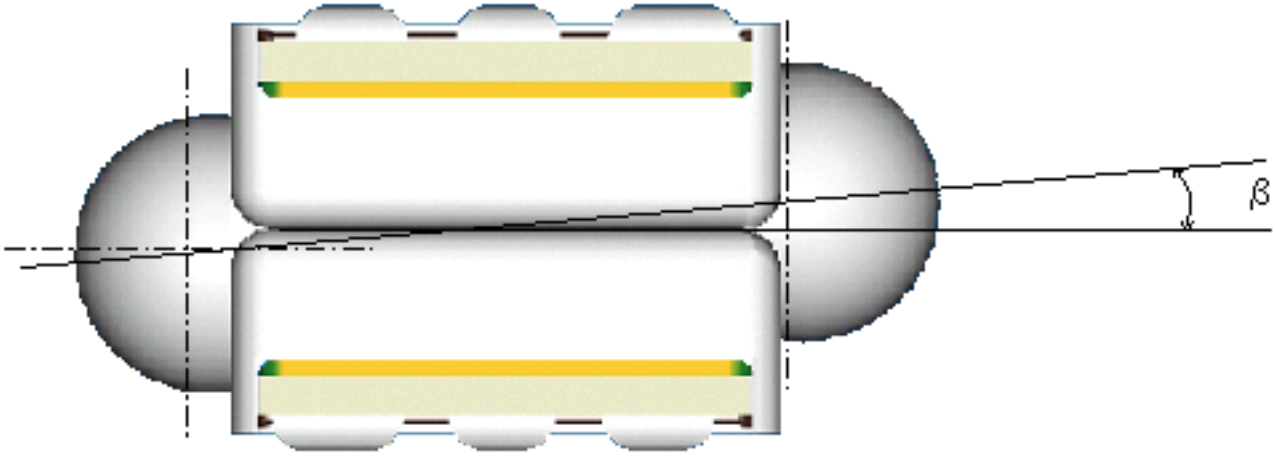


Figure 4. Angle between the CC-MIC case and the spouts.

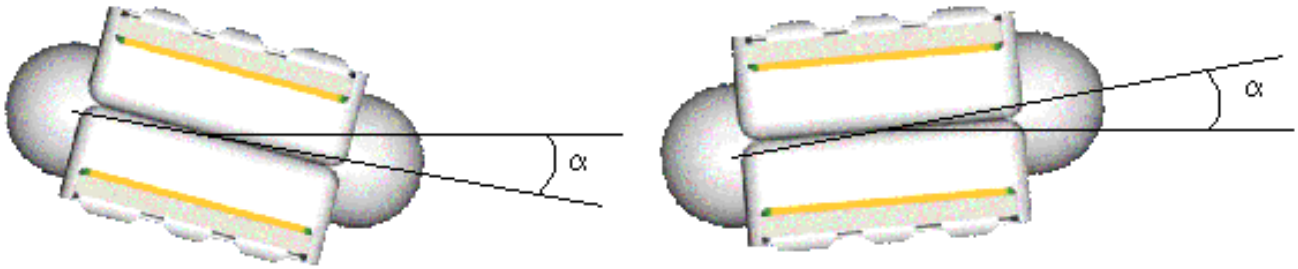


Figure 5. Advised maximum angle between the horizontal plane and the spouts.

Venting

Vented hearing instruments allow ambient sound, low bass frequencies especially, to bypass the directional microphone by entering
the ear through the vent. This effectively reduces the directivity of the hearing instrument since sound enters the vent omnidirectionally, that is, equally from all directions. Large vents allow more sound to enter and therefore have a greater effect than small vents. Consequently, it is important to minimize the vent size when a directional microphone is being used.

Wiring Configuration

Figure 6 and 7 shows the wire configuration of the CC-MIC.

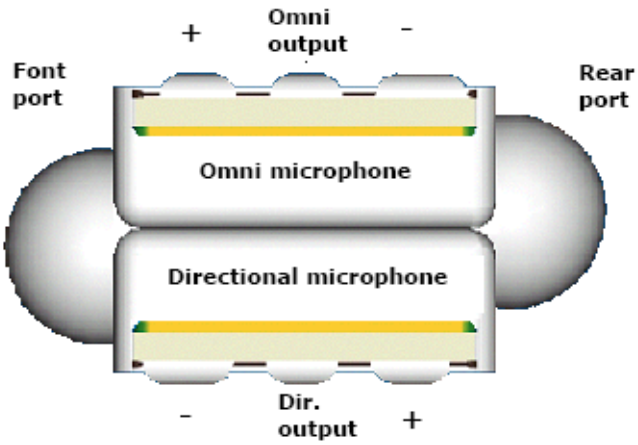


Figure 6. Backview of CC-MIC shows left ear wire configuration.

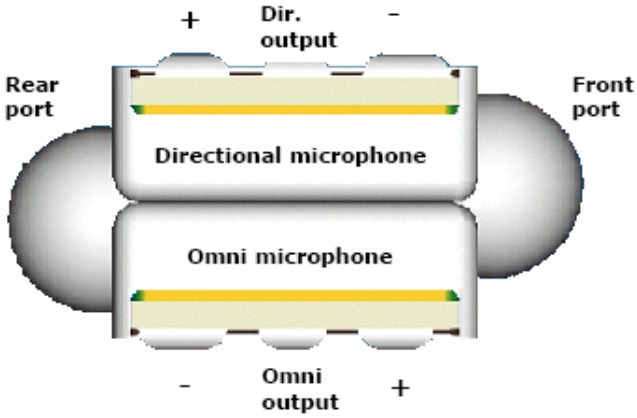


Figure 7. Backview of CC-MIC shows right ear wire configuration.