Sound Source

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Air Flow Control™ Technology

Bilsom® recently introduced Air Flow Control™ technology into its Leightning® and Thunder® series earmuffs. What is Air Flow Control?

Air Flow Control [AFC] is the solution to a problem typically seen with traditional earmuffs – they attenuate very well in high frequencies, but poorly in the low frequencies. Thus, traditional earmuffs do not provide optimal overall protection for environments with high levels of low-frequency noise. AFC delivers superior low-frequency attenuation and performs more consistently across the whole frequency range without increasing the size or weight of the earmuff. In fact, overall attenuation improves because of the better low-frequency attenuation!

So, how does it work?

First, think about sound and the ear. Sound waves travel through the air and are collected by the outer ear. When wearing an earmuff, there are three ways that sound waves can bypass the earmuff and still enter the ear canal:

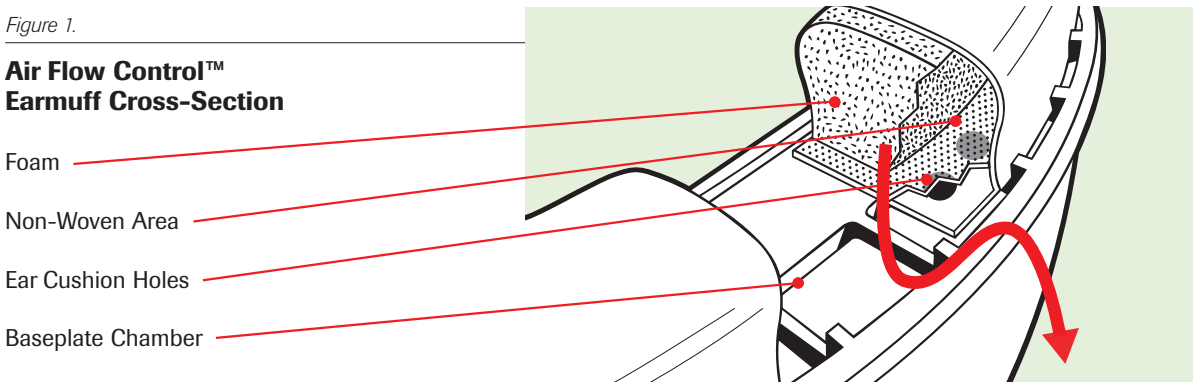
- **Leakage** – sound waves move around the earmuff, entering through gaps in the ear cushion seal
- **Penetration** – sound that transmits directly through the shell of an earmuff
- **Vibration** – movement or subtle shaking of the earmuff as a whole

Earmuff designers try to minimize these three pathways of sound entering the ear canal. Leakage and penetration are difficult to minimize without increasing the earmuff's size or weight. However, Bilsom engineers have been able to decrease vibration without adding any weight to the earmuff through AFC, thus providing better low-frequency attenuation and a higher overall Single Number Rating [SNR].

Inside the snap-in AFC ear cushion [Figure 1], a series of holes along the bottom of the ear cushion allows the cushion to breathe easier. The holes connect to baseplate chambers that channel the air out of the base of the cushion. This flow of air is further controlled by a non-woven layer inside the ear cushion designed to keep high-frequency resonance out of the hearing range. The result is a controlled flow of air that dampens low-frequency vibrations while still keeping excellent high-frequency attenuation.

Figure 1.

Air Flow Control™ Earmuff Cross-Section



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AFC is comparable to a car's shock absorber, which is literally designed to absorb shock and dampen vibrations from the road. As the car encounters bumps on the road, pistons move in and out to absorb the vibrations, providing a smooth ride. The ear cushions of an earmuff work in a similar manner. When traditional adhesive ear cushions are compressed, the air inside can only escape through a single pinhole. This makes the ear cushion stiff, and more likely to transmit vibrations, especially in low frequencies, just as a stiff shock absorber would transmit vibrations and cause a bumpy ride. However, by giving the air a pathway out, the ear cushion is less stiff and does not transmit sound wave vibrations.

Compared to other earmuffs, earmuffs with AFC provide better low-frequency attenuation, while maintaining superior high-frequency attenuation. The result is a better overall attenuation, especially in slimline and medium-sized earmuffs. Table 1 shows how AFC boosts the SNR of the Bilsom® Thunder® T2 earmuff from 30 to 33, with a significant increase in attenuation in the 63 – 500 frequencies.

Table 1.

Bilsom® Thunder® T2 Attenuation Comparison with/without Air Flow Control™									
Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	**SNR**
T2 without AFC	18.6	14.4	20.3	30.1	40.3	36.9	39.3	37.6	**30**
T2 with AFC	20.3	20.5	28.0	31.9	38.5	37.1	37.6	38.0	**33**

Innovations such as Air Flow Control help to encourage workers to wear their earmuffs on the job and achieve 100% wear-time. Users gain significantly more protection from hazardous low-frequency noise, without any increase in size or weight of the earmuff.

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Sound Source is a periodic publication of the Bacou-Dalloz Hearing Safety Group, addressing questions and topics relating to hearing conservation and hearing protection.