Impedance is resistance across a path that includes capacitors and inductors.

- A capacitor blocks slow/DC signals but lets fast/high-frequency ones through
- An inductor does the opposite — it passes DC but chokes high-frequency signals

A circuit or amp output impedance and speaker's load impedance is an important relationship. When mismatched it can waste power or degrade the signal.

In an amp/speaker relationship, the ideal is to have the amp impedance much lower than the speaker impedance. This is called the damping factor.

A damping factor of 8 is good.

An amp doesn't just set the speaker in motion, it's a dynamically controlled relationship. If the amp impedance is too high, it loses that control, and the sound degrades as the speaker cone wobbles around restrained only by physical design.

- Running a **4Ω speaker on an amp rated for 8Ω minimum** draws double the current. The amp runs hot, distorts, and can outright fail — either tripping protection circuits or burning output transistors. Do this long enough and you're buying a new amp.
- Going the other direction — a **16Ω speaker on an amp expecting 4Ω** — won't blow anything up, but you're leaving most of your power on the table and potentially driving the amp into a region where its own distortion goes up significantly.

Multiple speakers compound this fast. Two 8Ω speakers wired in parallel present a 4Ω load. Get this wrong with a cheap amp and you'll see it thermally shut down mid-show, or worse.

Mic impedance mismatching is subtler but can be more insidious because it degrades signal *before* you've even amplified anything — you're corrupting the source.

The classic rule was **impedance bridging**: the mic preamp's input should be at least **5–10× higher impedance than the mic's output**. This ensures maximum voltage transfer and doesn't load down the mic.

Dynamic mics (like an SM58) are low-impedance (~150–300Ω output) and fairly forgiving. Plug one into a high-impedance input (like a cheap guitar amp's instrument input) and you get **high-frequency rolloff** — the top end of the sound gets physically filtered out by the impedance mismatch acting like a passive low-pass filter.

Ribbon mics are where this becomes serious. Ribbons are extremely low impedance (sometimes under 30Ω) and the ribbon element itself is a literal strip of thin metal foil. Certain preamps — especially older ones or cheap ones — have poorly controlled input impedance that can interact badly with a ribbon. Some transformerless preamps can actually cause **DC offset or reverse current conditions** that physically stretch or tear the ribbon.

Phantom power (+48V) is the other major danger zone. Phantom is safe for condenser mics and most modern dynamic mics — it's balanced and equal on both signal pins. But:

- **Unbalanced dynamic mics** wired with certain adapters can have phantom voltage appear asymmetrically across the voice coil, potentially **burning the coil out**
- **Vintage or cheap ribbon mics** (without proper transformers) can have phantom voltage surge through the ribbon and vaporize it instantly
- **Improperly wired cables** with phantom enabled can send voltage somewhere it shouldn't go — into a preamp output, into a DI box's unprotected input, etc.