

# Why do voice-coils burn out?



## Loudspeaker voice-coils

In general, loudspeaker voice-coil destruction is the main reason for guarantee exclusion, a common practice among loudspeaker manufacturers. Here are the fundamental reasons justifying this exclusion.

Contrary to popular belief, using loudspeakers presupposes combination with electronics powerful enough to guarantee distortion-free operation. To achieve the best compromise between these two factors, it is important to choose amplification at least compliant with the nominal power required by the loudspeaker kit.

For a maximum 150 Watt kit, the nominal power is approximately 80 Watts. In this case, amplification ranges between 80 Watts RMS and 160 Watts RMS. This has the best potential to optimise performance and ensure that the voice-coils last correctly.

Bear in mind that a kit or a subwoofer is a passive component in terms of musical expression, which is downstream of the electricity generation components. Therefore, amplification electronics and reading sources are indispensable. Loudspeakers are capable of withstanding very high peak powers (or "impulses") if the signal provided by the amplifier is clean and not distorted.

Contrary to all other defects, a burned or melted voice-coil is a sure sign that the loudspeaker has been the victim of an electrical surge. The latter can occur without the user actually being aware (distortion present but not audible) and in order to prevent the

same situation from happening again, it is very important to determine the cause(s) at the origin of your problem.

## **The most common causes of voice-coil problems**

### **Amplifier far too powerful**

Contrary to another popular belief, it is rare for a powerful amplifier to damage a loudspeaker. Even at a high level, the signal remains clean and with very little distortion. For example, a great number of professionals have seen the power indicators on large amplifiers reach 300 Watts in a short burst, without causing any damage, even though the speaker used was only a maximum of 90 or 100 Watts. If the amplifier is really too powerful (double or triple the power of the loudspeaker), there's a risk that requires reasonable control of the sound level. In this precise case, the device may lead to the destruction of the bass speakers.

### **Amplifier not very powerful or under-scaled**

A common and unfortunately dangerous situation. As a precautionary measure or unfamiliarity with reality, many users choose an amplifier which is too weak. At high regime it will clip and distort or fail to send "square signals" or, through power supply destabilisation, it will supply direct current to the loudspeaker, which will be fatal for it. During clipping, a 40 Watt amplifier can reach 100 or 120 Watts distorted over 1 millisecond. This problem is often encountered on 40 or 50 Watt amplifiers from bottom of the range manufacturing or to prevent listening at high level. In this other case, the device may lead to the destruction of the treble speakers. If the power gap is large (amplifier less than 30 Watts for an 80 Watt loudspeaker for example), the bass power supply will become difficult and may damage the loudspeaker.

### **Amplifier malfunction**

Amplifier malfunction is difficult to detect as it can have multiple causes.

#### **Direct current:**

In this amplifier clipping scenario, destabilisation of the power supply may result in sending a direct current into the speaker voice-coils.

#### **Set-up error**

A poor contact between the connection wire + and - terminals can be at the origin of important noise, which results in a burst of amplifier distortion at high levels of electrical power. Uncontrolled volume on switching on, which can be excessively aerated as soon as the first notes are heard (rapid intervention to a normal level will not prevent damage to the voice-coils).

## Use error

- **Excessive use of sound volume:** the more powerful the surround system and more excessive the volume, the greater the difficulty for the amplifier to relay a quality signal. If at moderate power (maximum one third of volume), the power and musicality achieved are not at all qualitative, increasing the volume may only make matters worse (appearance of distortions). It is necessary to have amplification that complies with the requirements of the loudspeaker.
- **Excessive use of the bass and treble correctors:** although reasonable correction can improve listening, setting the correctors to maximum or thereabouts will increase the power emitted in the registers concerned approximately three times or more. Example: without a corrector, at an average level of approximately 30 Watts (which is already loud), for a 2-speaker kit, the sound repartition will be approximately 7 Watts for the tweeter (treble) and 23 Watts for the loudspeaker. If the bass are turned up as high as they will go, they will receive (for the same volume setting), approximately 80 Watts instead of 23! In this case, it would be necessary for the amplifier used to be capable of delivering this power without distortion.
- **Immoderate use of an equaliser:** the main, true value of an equaliser is to correct any faults caused by the passenger compartment. Unfortunately, it is rarely used in this way and tends to be used as a corrector to amplify bass and treble with no reference to reality. In this respect, it is not rare for certain buttons on equalisers to be turned up to +12 decibels - the equivalent of multiplying the power delivered at this frequency by 16. If we take the example of a woofer receiving 27 Watts, correcting by 12dB corresponds to a request for:  $27 \text{ W} \times 16 = 432 \text{ Watts}$ ! As many amplifiers are not capable of delivering such power levels without clipping, this generates a considerable risk for the speaker.

## Tips for a better purchase choice

We usually recommend using a high power amplifier that provides a certain degree of use comfort, which avoids having to use a sound level which risks causing distortions. In many cases, it will be necessary to envisage exceeding 100 Watts RMS per channel.