DOPE FROM HOPE

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POWER RATINGS

An inquirer (who considers himself a novice) asks about speakers:

"A speaker manufacturer rates his speakers to handle 15 watts continuously, then says it takes 25 watts of amplifier rating to drive the speaker. What does this mean?"

Practically it probably doesn't mean a dam' thing. Translating what the maker of the speaker seems to mean is that 15 watts steady state power (as during a sustained oscillator test) will not destroy the speaker, and that an amplifier of 25 watts rating will deliver "adequate" transient peak acoustic power.

What the inquirer really wants to know is "What size amplifier shall I buy?" This is really the first of 2 questions. The answer, applied to KLIPSCH speakers, would be a maximum of 100 watts (sine wave rating) per side. If a higher power is used, precautions may be needed to prevent speaker damage. Crown suggests a one ampere fuse for each channel.

The second question, I think we can assume, is fishing for a realistic relation between sound pressure level and amplifier power.

Accept the figure the figure that 115 dB peak sound level pressure at the listener's ear will be as loud as what you would hear at a live concert. (A sound level meter would read 103 dB at "maximum" swings, because a V.U. meter has a "delay" or "lag", and instantaneous peaks are about 13 dB higher than the meter reading peaks).

In a typical 4000 cubic foot listening room, this requires 40 peak amplifier watts to feed a group of high efficiency loudspeakers: assuming this to be 2-channel stereo, 20 peak watts per channel or 60 watts average sine wave power rating per side is required. For a low efficiency speaker (of the typical so-called air suspension type) over 100 times as much amplifier power would be necessary: that makes over one kilowatt of sine-wave rated power for each channel.

Our tests at KLIPSCH and ASSOCIATES, Inc. show a range of efficiency among speakers of 22 dB or 160:1. Obviously speaker efficiency is a factor in how much amplifier power you need.

(OVER)

...The mark of integrity in loudspeakers!

The Dope From Hope is a spasmodic publication of Klipsch and Associates, Inc., Hope, Arkansas, U. S. A.
From known efficiencies, and typical room characteristics, a table may be constructed:

TABLE

<table>
<thead>
<tr>
<th>Speaker Type</th>
<th>Amplifier rated Power Required to produce 115 dB Peak Sound Pressure Level in typical room Each Channel of a 2-channel Stereo</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Efficiency Horn Type (KLIPSCHORN BELLE KLIPSCH)</td>
<td>10</td>
</tr>
<tr>
<td>Large Direct Radiator of Medium Efficiency (CORNWALL)</td>
<td></td>
</tr>
<tr>
<td>Small Direct Radiator of Medium Efficiency (HERESY)</td>
<td></td>
</tr>
<tr>
<td>&quot;Air Suspension&quot; Low Efficiency (Various bookshelf speakers)</td>
<td></td>
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</tbody>
</table>

* The chances are this peak power will destroy the speakers, and several speakers would be needed to absorb this much power.

While not related to power input and power output, a word about frequency response should be injected here: high efficiency speakers are capable of design such that they offer a smoother tonal response than low efficiency speakers. This is not always realized: there are good and bad designs and executions in both categories. The point is that one need not sacrifice efficiency in the interest of smooth tonal response.

It is a fact of observation that the higher the efficiency of a loudspeaker, the lower the distortion. This is really the most important attribute of loudspeaker performance. As a natural consequence the very low efficiency speakers exhibit gross distortion at sound pressure levels in excess of about 95 dB.

Only for the Technical Reader

You may wonder how a one ampere fuse can suffice for 100 watts of amplifier power into an 8 ohm load. Since $P = 100 \ I^2 = 100/8 = 12.5$ and $I = 3.5$ amps approximately. The answer is that in music, instantaneous peaks are about 13 dB above the “average peaks” as read on a V.U. meter, and they occur rarely enough so that relatively little heating occurs compared to the heating due to average power. One ampere is 10.9 dB below 3.5 amps, so it should not “blow” on music, and you can surely blow it with 100 watts “steady state”.

I once thought that the instantaneous peaks destroyed voice coils by sheer mechanical force, but some work here by R. B. Moore using short “tone bursts” shows that peaks of up to 150 watts can be tolerated by rather delicate tweeter component speakers if the duration of the pulse is short and the heating is not excessive. In numbers, a tweeter rated at 2 watts continuous power withstood over 100 watt peaks when tone burst was of a 20000 Hz signal, one cycle on, one second off.

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