

# HiFi LOUDSPEAKER DESIGN

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## Onken Bass Relax Loudspeaker



1. In order to achieve an optimal quality (  $Q_{tc}=0.707$  ), the so-called Thiele Aligement (n) is used - usually  $n=5.7$
2. The total area of the tunnels is about 90% of the total area of the active diaphragm surface in the best case.
3. Moved air masses behind the driver and in the tunnels should be identical.
4. The resistance of the low-pass inductor is to be included absolutely also into the computation of the total quality factor ( $Q_{ts}$ )!
5. To the housing volume ( $V_b$ ) the tunnel volume has to be added.

### Onken Loudspeaker Calculator

Based on research of M.Eijiro Koizumi, J.Mahul & J.Hira

#### Driver Parameters

**all fields are required!**

Fs	[Hz]	Free air resonant frequency of the driver	<input type="text" value="40"/>
Re	[ohms]	dc resistance of the driver	<input type="text" value="6.8"/>
Qms		mechanical Q of the driver	<input type="text" value="1.65"/> 2 - 16
Qes		electrical Q of the driver	<input type="text" value="0.61"/>
Mms	[g]	total cone assambly mass of the driver	<input type="text" value="14.97"/>
Sd	[cm <sup>2</sup> ]	effective radiation area of the driver	<input type="text" value="212"/>
Rg	[ohms]	total components resistance (xover-coiol, terminal, wires, etc.)	<input type="text" value="1.55"/>

Port width	[cm]	indicate the width of one port	<input type="text" value="1.2"/>
Port height	[cm]	indicate the height of one port	<input type="text" value="10"/>
Quantity		number of ports used (Onken speakers have 6 or 8 identical ports)	<input type="text" value="8"/>
n		Alignment (best alignment = <b>5.7</b> , Onken alignment = <b>6.34</b> )	<input type="text" value="6.34"/> *

\* **Note:** you can change the alignment factor ( n ) to maintain the corrected Portlength under **61 cm**

If the corrected Portlength is above **61 cm**, your speaker is **not suitable** for the Onken speaker application!

**Calculate**

### Onken Loudspeaker Calculations

Qts =	<input type="text" value="0.45"/>	total Q of driver at fs	Cms =	<input type="text" value="0.0010"/>	m/N driver suspension compliance
Vas =	<input type="text" value="66.56"/>	air volume driver compliance (liters)			
F-3 =	<input type="text" value="32.5"/>	box cutoff frequency at -3dB (Hz)	Fb =	<input type="text" value="30.3"/>	box cutoff frequency (Hz)
Cab =	<input type="text" value="7.19"/>	acoustical box compliance	Map =	<input type="text" value="38.41"/>	acoustical mass box
no =	<input type="text" value="0.007"/>	driver reference efficiency (%)	Qtc =	<input type="text" value="0.574"/>	total Q of the speaker in an enclosure including all system resistances

### Port Calculations

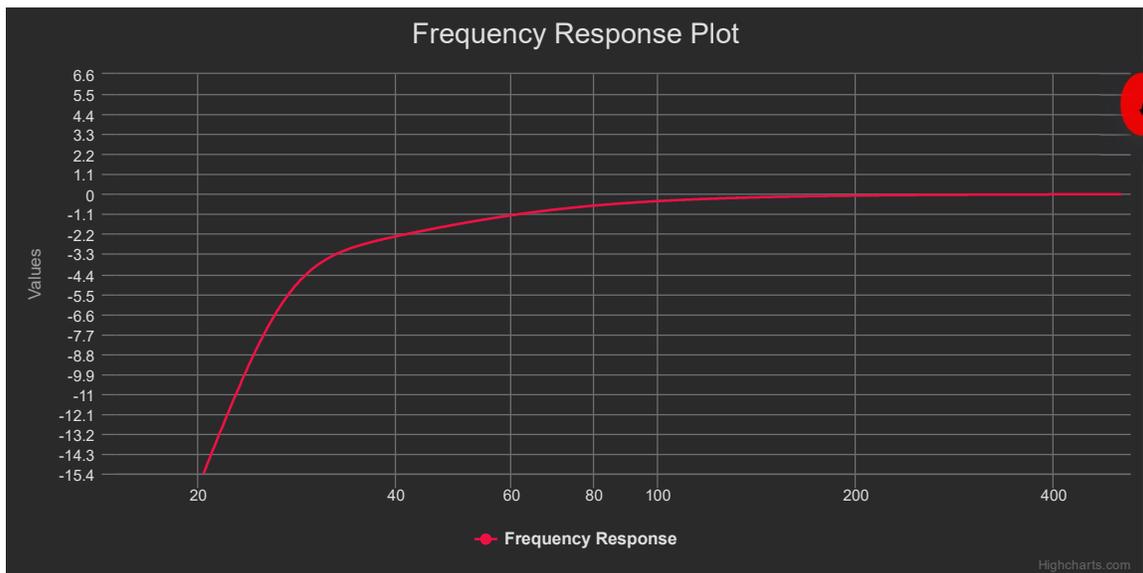
S <sub>port</sub> =	<input type="text" value="96"/>	(cm <sup>2</sup> ) total port area (S <sub>port</sub> should be equal or max. 15% less than S <sub>d</sub> )
Port volume =	<input type="text" value="2.21"/>	total volume occupied by all ports in the box (liters)
Port length =	<input type="text" value="28.52"/>	effective port length (cm)
Port length corrected =	<input type="text" value="23.05"/>	corrected effective port length (cm)

**Note:**  
If the corrected effective port length is **over 45 cm**, your driver is **not suitable** for the Onken Loudspeaker!

### Onken Loudspeaker Properties

V <sub>b</sub> =	<input type="text" value="100.7"/>	total internal volume of box (liters)
V <sub>b</sub> total =	<input type="text" value="102.91"/>	total internal volume of box plus the required volume for the vent (liters)
F-3 =	<input type="text" value="32.5"/>	box cutoff frequency at -3dB (Hz)
SPL =	<input type="text" value="88.5"/>	total efficiency of the system including R <sub>g</sub> (dB 1W/1mtr)

**View Plot**



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