

Designing bass-reflex enclosure

Step-0 Speaker's spec

$f_0 = 25$ [Hz]
 $Q_0 = 0.31$
 $m_0 = 55$ [g]
 $a = 12.95$ [cm]

Step-1 Determine Alpha

$\text{Alpha} = 2$ (Recommended value: 1-2)
 (Limit: 0.5-3)

FYI

Q_0 : Speaker's Q_0 (including output Z of amp)
 α : Stiffness ratio of speaker and enclosure
 f_0 : Speaker's lowest resonance frequency
 f_l : Cut off frequency (-3dB)

Conditions for flat response

No.	Q_0	Alpha	f_b/f_0	f_l/f_0
1	0.18	10.5	2	2.7
2	0.21	7.5	1.7	2.3
3	0.26	4.5	1.4	1.8
4	0.3	3	1.2	1.5
5	0.38	1.4	1	1
6	0.42	1.1	0.93	0.87
7	0.47	0.73	0.83	0.73
8	0.52	0.56	0.76	0.64
9	0.56	0.49	0.72	0.6

Step-2 Duct Tuning Frequency

$f_b = 30$ [Hz]

Tuning frequency

Q_0	f_b [Hz]	Q_0	f_b [Hz]
0.2	$f_0 * 1.8 = 45$	0.42	$f_0 * 0.9 = 22.5$
0.22	$f_0 * 1.6 = 40$	0.45	$f_0 * 0.9 = 22.5$
0.25	$f_0 * 1.5 = 37.5$	0.48	$f_0 * 0.8 = 20$
0.28	$f_0 * 1.3 = 32.5$	0.5	$f_0 * 0.8 = 20$
0.3	$f_0 * 1.2 = 30$	0.52	$f_0 * 0.75 = 18.75$
0.32	$f_0 * 1.2 = 30$	0.55	$f_0 * 0.7 = 17.5$
0.35	$f_0 * 1.1 = 27.5$	0.58	$f_0 * 0.7 = 17.5$
0.38	$f_0 * 1.0 = 25$	0.6	$f_0 * 0.65 = 16.25$
0.4	$f_0 * 1.0 = 25$	0.62	$f_0 * 0.65 = 16.25$

Step-3 Volume of enclosure

$V = 145.22$ [l] (Calculated from parameters above)

$V = 77.00$ [l] (Corrected)

Step-4 Dimension of duct

$k = 0.3$ (Recommended value: 0.2-1)

$S = 158.06$ [cm²] (Calculated)

$S = 36.32$ [cm²]

$L = 10.75$ [cm] (Calculated)

Dimension input

$d = 6.8$ [cm] ==>

$L = 13$ [cm] ==>

$f_b = 27.52$ [Hz] (Re-calculated)

Step-5 Dimension of enclosure

$W = 360$ [mm]

$H = 710$ [mm] ==>

$D = 310$ [mm]

$V = 79.24$ [l]