# Passive Loudspeaker Crossover Inductor and Capacitor Values

Inductor and capacitor values for first- or second-order passive two-way speaker crossovers (Butterworth or Linkwitz–Riley) from frequency and impedance.

**Method:** Passive crossover network formulas for resistive loads

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Crossover type | Second-order Butterworth (12 dB/octave) | |
| Crossover frequency | 2,500.0 | Hz |
| Woofer nominal impedance | 8.0000 | Ω |
| Tweeter nominal impedance | 8.0000 | Ω |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Woofer series inductor (low-pass) | 0.72025 | mH |
| Woofer shunt capacitor (second order) | 5.6270 | µF |
| Tweeter series capacitor (high-pass) | 5.6270 | µF |
| Tweeter shunt inductor (second order) | 0.72025 | mH |

**Notes for this case**

• Values for resistive loads equal to the nominal impedance. Real drivers have rising impedance (voice-coil inductance); add a Zobel network or measure and adjust. Second-order sections reverse the tweeter polarity for flat summing (Linkwitz–Riley).

## Formula and method

$$\text{1st order}: \; L = \frac{R}{2\pi f_c}, \; C = \frac{1}{2\pi f_c R}$$

$$\text{2nd}-\text{order Butterworth}: \; L = \frac{\sqrt{2}\,R}{2\pi f_c}, \; C = \frac{1}{2\sqrt{2}\,\pi f_c R}; \quad \text{Linkwitz–Riley}: \; L = \frac{2R}{2\pi f_c}, \; C = \frac{1}{4\pi f_c R}$$

### Variables

| | | |
|---|---|---|
| $\text{type}$ | Crossover type | - |
| $f_c$ | Crossover frequency | 1/s |
| $R_W$ | Woofer nominal impedance | Ω |
| $R_T$ | Tweeter nominal impedance | Ω |
| $L_W$ | Woofer series inductor (low-pass) | H |
| $C_W$ | Woofer shunt capacitor (second order) | F |
| $C_T$ | Tweeter series capacitor (high-pass) | F |
| $L_T$ | Tweeter shunt inductor (second order) | H |

### Method and standards

Passive filter design for loudspeakers.

### Assumptions and limits

- Resistive load equal to the nominal impedance.

### References

Passive crossover network formulas for resistive loads

## Report details

| | |
|---|---|
| Report reference | FCC-P8TG-6WS8 (the same inputs always give the same reference) |
| Generated | 23 November 2026, 17:34 UTC |
| Calculator | Passive Loudspeaker Crossover Inductor and Capacitor Values |
| Method last reviewed | 17 November 2026 |
| Software release | FireCAD Calc, release of 22 November 2026 |
| Release checks | 3 reference cases of this calculator, computed independently, are checked on every release |

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

### This calculator online

https://calc.firecad.com/electrical/electronics/speaker-crossover-components

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.