A two-way speaker with a Visaton woofer, tweeter and crossover

W 130 S woofer, TW 70 tweeter and HW 2/70 NG crossover in a 7-liter sealed box: sizes, holes, wiring with the + in the right place, and a listening test.

Online guide, always up to date

By **Ada Intelisano** · informaticait.it technical team

IN SHORT

- Three 8 Ω Visaton parts: W 130 S woofer, TW 70 tweeter, HW 2/70 NG crossover at 3000 Hz.
- A 7-liter sealed box, as Visaton specifies for the W 130 S: 160 × 250 × 175 mm inside, 19 mm MDF.
- On the crossover: IN to the amplifier, B to the woofer, H to the tweeter, always + to +.
- First test at low volume with the box still open; with two speakers, the balance control reveals one wired backwards.

Time: a weekend | Level: woodwork and some soldering | Before: guides no. 66 and 67

In guides no. 66 and 67 a single full-range speaker did everything. Here the work is split: the woofer handles the bass and the voices, the tweeter the treble, and in between a crossover sends each one its share. Why impedance and filter slope matter is explained in the article "Woofer, tweeter and crossover: the basics of a two-way speaker" in the site's News and tips section. This guide is the practical step: a sealed box with three Visaton parts, from cutting the panels to the first listening test. The sizes are for one speaker; for a stereo pair, double everything.

1 The parts, for one speaker

- **Visaton W 130 S, 8 Ω**: 13 cm woofer, 50 W rated;
- **Visaton TW 70, 8 Ω**: cone tweeter with a sealed back, so it needs no separate chamber in the box;
- **Visaton HW 2/70 NG, 8 Ω**: ready-built two-way crossover, with its crossover point at 3000 Hz;
- 19 mm MDF for six panels, wood glue, wood screws, a bag of polyester speaker wadding, a tube of silicone;
- red and black 0.75 mm² speaker cable, 4.8 mm and 2.8 mm female spade connectors with a crimping tool, a soldering iron;
- to play music, the DFRobot DFR0803 Bluetooth amplifier with the 12 V power supply from guide no. 67.

New word: way
The sound enters the speaker and takes two paths: one carries the bass to the woofer, the other the treble to the tweeter. Each path is a "way"; the two split in the crossover.

2 Why these three parts work together

	W 130 S	TW 70	HW 2/70 NG
Impedance	8 Ω	8 Ω	8 Ω
Rated power	50 W	40 W with a 3000 Hz high-pass (80 W at 5000 Hz)	100 W
Sensitivity (1 W, 1 m)	87 dB	90 dB	–
Frequency range	up to 12,000 Hz	800–20,000 Hz	crossover at 3000 Hz, 12 dB/octave
Cutout	109 mm	64 mm	board 150 × 100 mm

- **All 8 Ω.** The crossover is designed for 8 Ω speakers, and the W 130 S also comes in a 4 Ω version: get the right one.
- **The tweeter needs the filter.** Visaton rates the TW 70 only with a high-pass filter in front of it: 40 W with the crossover at 3000 Hz and 12 dB per octave, which is exactly the HW 2/70 NG. The SC 10 N dome tweeter from the article, on the other hand, is rated with the crossover at 2000 or 4000 Hz, not 3000: that's why we use the TW 70 here.
- **How much power.** The most delicate part is the tweeter, with its 40 W. The DFR0803 at 12 V gives 12 W per channel into 8 Ω, and even at 24 V it stays at 38 W, according to the DFRobot table in guide no. 67: below 40 W in both cases (our reasoning).
- The tweeter is more sensitive than the woofer, 90 dB against 87: with the same signal it plays a little louder. If that bothers you, step 8 explains how to turn it down.

3 How big a box

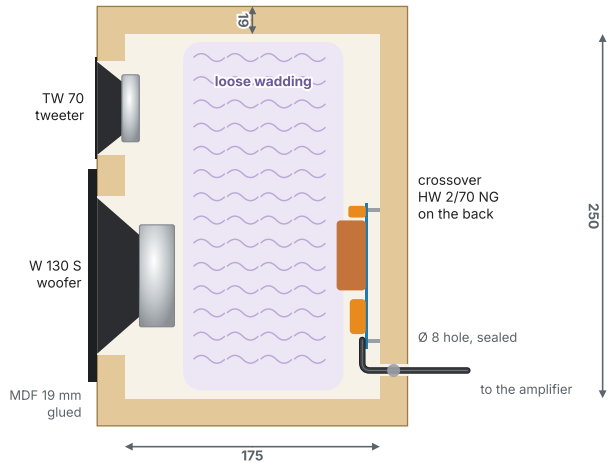
The woofer decides the volume, and for the 8 Ω W 130 S Visaton states it: a **7-liter sealed box**, with the cut-off frequency at 86 Hz and a Qtc of 0.77. The same numbers come out of the datasheet parameters, Qts 0.47 and Vas 12 liters, with the sealed-box formula from guide no. 67:

$$V = 12 \div ((0.77 \div 0.47)^2 - 1) \approx 7.1 \text{ liters} \quad \cdot \quad fc = 52 \text{ Hz} \times 0.77 \div 0.47 \approx 85 \text{ Hz}$$

> **New word: Qtc**
> It tells you how much the woofer is “held back” by the air sealed in the box: the smaller the box, the higher it goes. For the 7 liters Visaton gives 0.77.

Visaton doesn't say whether its 7 liters are net or gross: the woofer and the crossover take up a little room, but the wadding spread inside, Visaton writes, makes the box seem about 20% larger.

The box from the side, cut in half



inside 160 × 250 × 175 mm = 7.0 liters

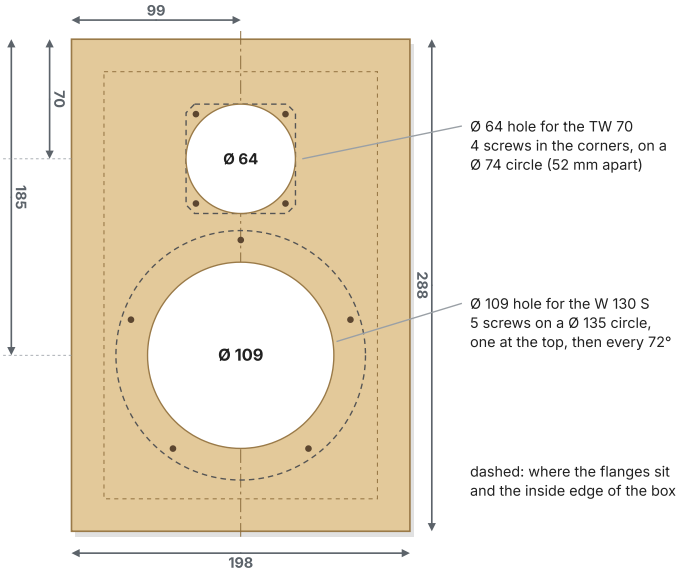
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The numbers check out (our own check). Our proposal is an inside size of **160 × 250 × 175 mm**, that is 7.0 liters, with the tweeter at the top and the woofer below.

4 Cut the panels

Visaton recommends **19 mm** walls for ordinary boxes, in MDF, plywood, chipboard or solid wood, with the panels butt-jointed and glued. The sizes below are for 19 mm MDF.

The front panel (mm, indicative sizes)



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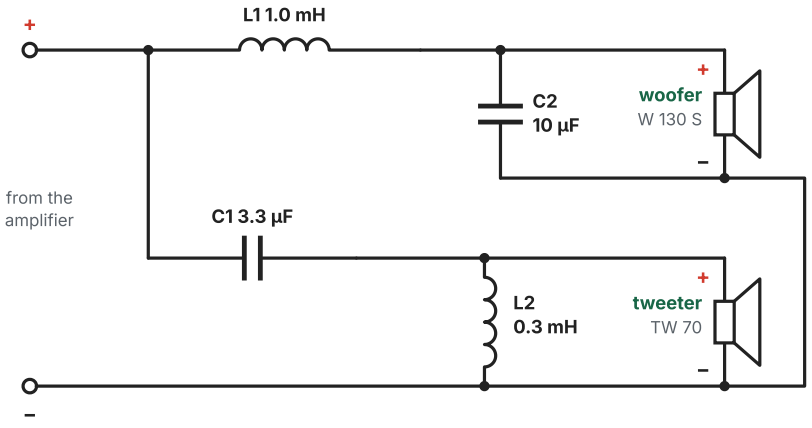
Part	Qty	Size (mm)	Notes
Front	1	198 × 288 × 19	Ø 64 and Ø 109 holes, screws: see the drawing
Back	1	198 × 288 × 19	Ø 8 cable hole, centered, 38 mm above the bottom edge
Top and bottom	2	198 × 175 × 19	full width, between front and back
Sides	2	175 × 250 × 19	between top and bottom

Indicative sizes: if your panels are a different thickness, recalculate keeping the inside size fixed; before drilling, measure the speakers you actually have. Assembly: front and back full size, top and bottom between front and back, sides between top and bottom. Glue

everything **except the back**, which you close at the end. The screws of the two speakers go into a **pilot hole**: in MDF, Visaton warns, they snap easily.

5 The crossover

Inside the HW 2/70 NG: two parts per way



the woofer gets what lies below 3000 Hz, the tweeter what lies above

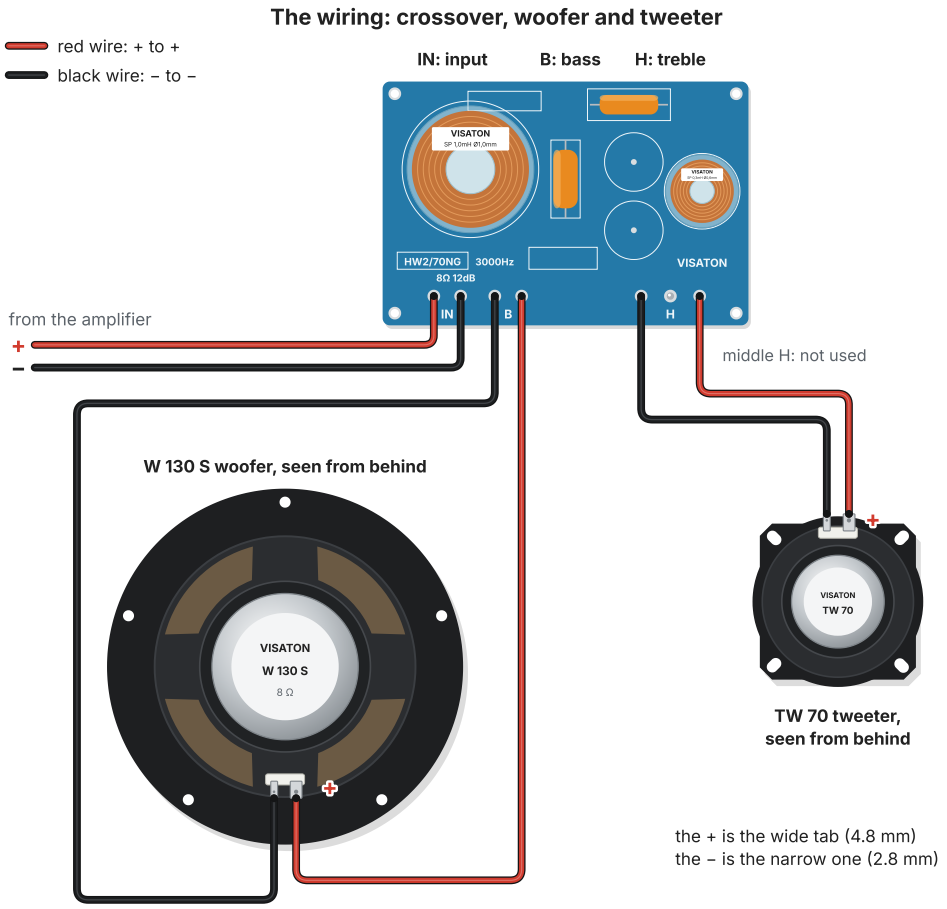
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- On the way to the woofer the signal goes through a 1.0 mH coil, which lets the bass through and holds back the treble; the 10 µF capacitor shunts away what is left of the treble. Toward the tweeter it's the opposite: the 3.3 µF capacitor blocks the bass, and the 0.3 mH coil takes away whatever gets through. Two components per way give the 12 dB per octave.
- The pads are labeled on the board: **IN** from the amplifier, **B** (bass) to the woofer, **H** (treble) to the tweeter. The middle H pad has no function; it is there for anyone who modifies the filter.
- Visaton tests every crossover individually: operation, slope and crossover frequency. Where you put it is not critical; Visaton suggests the back panel, behind the woofer hole, where there is room. Fix it with four screws and four spacers, so the solder joints under the board don't touch the wood.

6 Wiring

- Cut three lengths of cable: one from the amplifier to IN (through the hole in the back), one from B to the woofer, one from H to the tweeter.
- On the crossover, solder the wires to the pads, always red on **+**. 0.75 mm² cable is fine: Visaton allows at most 1.5 mm² on the solder points.
- No solder on the speakers: crimp on the spade connectors. The **+** is the wide tab, 4.8 mm; the **–** is the 2.8 mm one. So the big connector goes on the + and you can't get it wrong.
- Fix the cables to the walls with a drop of hot glue: Visaton recommends that nothing inside the box should be able to rattle.

✓ Check again
Red: amplifier + → IN+, B+ → wide tab on the woofer, H+ → wide tab on the tweeter. Black on the others.



7 The first test, with the box still open

Visaton suggests doing the first test before closing the box: speakers screwed to the front, crossover still outside, wires coming out of the open back. Connect IN to channel L of the DFR0803 (the + and – are printed on the cover, guide no. 67), switch on and pick a track you know on your phone.

1. Start with the volume **very low**. Visaton repeats this for a reason: if the woofer and tweeter have been swapped, the tweeter gets the bass and can't take it.
2. Put your ear close: only the high sounds should come from the tweeter, like the cymbals and the “s” sounds in a voice; the rest comes from the woofer.
3. Then turn it up a little and listen from two or three meters away.

If it doesn't work

- The tweeter is silent: check the solder joints on H and the spade connectors. Visaton suggests testing the continuity of the wires and of the speaker with a multimeter (guide no. 8).
- Nothing plays: a broken wire between the amplifier and IN, or the amplifier isn't on.
- The bass comes out of the tweeter, which crackles: you have swapped B and H. Switch off at once and fix it.

8 Close, listen and adjust

- **The wadding.** A sealed box, Visaton writes, is filled with damping material evenly and without packing it down, for 80–100% of the volume; one Visaton mat is enough for about 10 liters. For our 7 liters that is roughly two thirds of a mat (our calculation). Leave the back of the woofer and the crossover clear.
- **The seal.** "A sealed box should be built as airtight as possible," says Visaton. Screw the crossover to the back, glue the back on, seal the cable hole with silicone. A bead of silicone or an adhesive gasket under the speaker flanges is common practice (Visaton's datasheets don't mention it).
- **With two speakers**, Visaton's check: put them side by side, send the same signal to both channels and move the balance from right to left. They should sound almost the same. If the bass is full only with the balance turned all the way to one side, one speaker is wired backwards: check the polarity at the amplifier terminals, on the crossover and on the drivers.
- **Treble too bright?** The HW 2/70 NG has no adjustments. Visaton turns the tweeter down with two resistors, one in series and one in parallel with the driver, between the H pads and the tweeter, so the crossover still sees 8 Ω. Never on the woofer: Visaton warns that it makes the response worse. Visaton's table for 8 Ω:

Attenuation	In series with the tweeter	In parallel with the tweeter
−2 dB	2.2 Ω	22 Ω
−4 dB	3.3 Ω	10 Ω
−6 dB	4.7 Ω	8.2 Ω

Try it yourself

- Build the second speaker and do the balance check.
- Power the DFR0803 at 24 V: 38 W per channel, still below the tweeter's 40 W. Keep an eye on the volume.
- For deeper bass Visaton also suggests a 20-liter bass reflex box for the W 130 S: you'll find it in the article.

✓ What you learned

- the crossover and the speakers must have the same impedance;
- the woofer decides the box volume, and the numbers can be checked;
- IN to the amplifier, B to the woofer, H to the tweeter, always + to +;
- first test at low volume, with the box still open.

Sources: Visaton: product pages, datasheets and dimensioned drawings of W 130 S – 8 Ohm, TW 70 – 8 Ohm and SC 10 N – 8 Ohm; HW 2/70 NG – 8 Ohm with its circuit diagram; 2023/2024 catalog · Visaton, Technische Grundlagen: “Hinweise zu Bauvorschlägen”, “Bedämpfung von Gehäusen”, “Fehlersuche”, “Pegelabsenkung mit ohmschen Widerständen” · DFRobot, DFR0803 (power table); Thiele and Small sealed-box formula · informaticait.it: article “Woofer, tweeter and crossover”, guides no. 8, 66 and 67