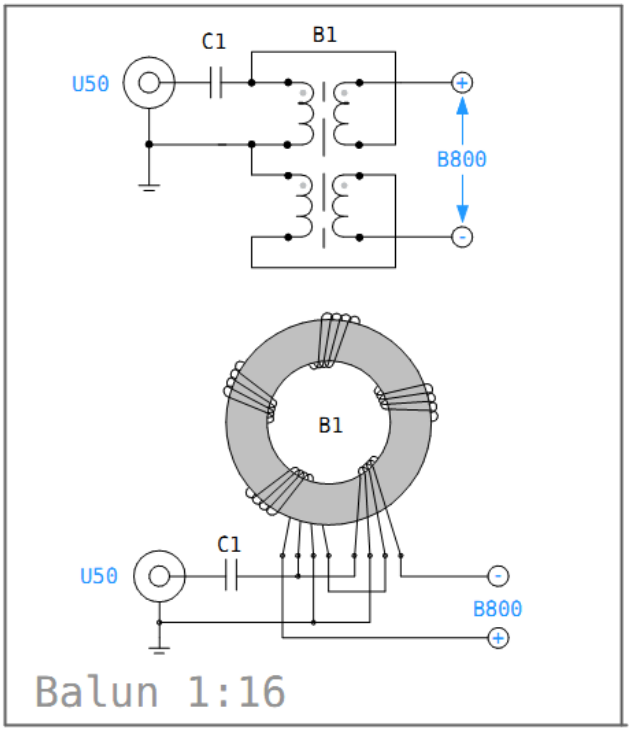
Single coil transformer balun 1:16

This is a simple wide band antenna transformer used as impedance transformer with high impedance balanced transmitting antennas. This medium power balun can handle up to 100W power.

- Unbalanced to balanced, impedance **1 to 16**, **50Ω to 800Ω**.
- Typical frequency range **3...30MHz** with SWR less than **1 : 1,4**
- Power handling capacity **50W** (carrier) with low SWR antenna.

Circuit Diagram



Toroid Core and Winding

With proto we used **Ferroxcube TX36/23/15-4C65** toroid, material **4C65**, Al=170nH, u=125**.** Similar toroid is **FT140-xx**, with material **61**, or **31** for lower frequencies.

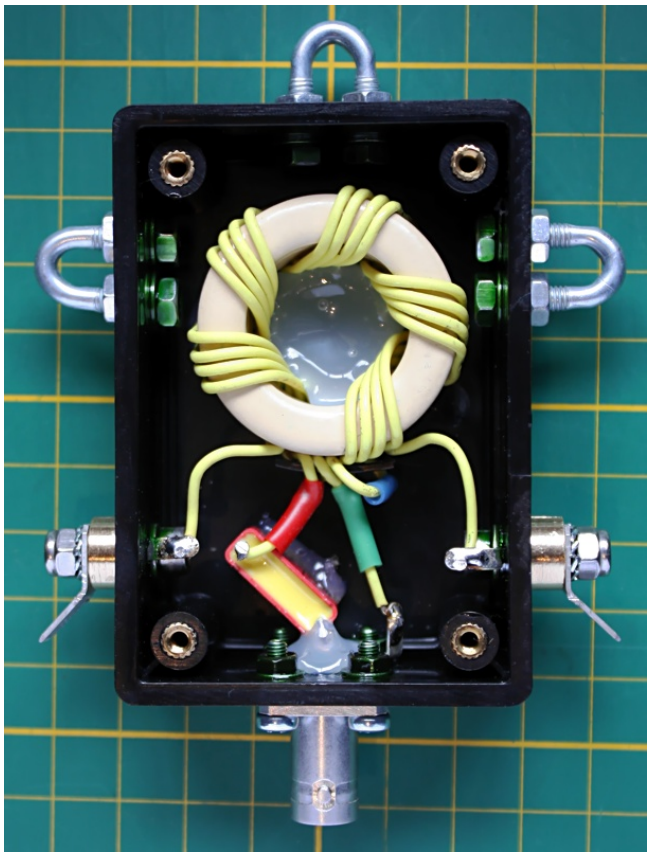
The wire is now 0,25mm^2 Suhner Radox stranded high temperature industrial wire, conductor diameter 0,57mm, insulator diameter 1,35mm. Any similar wire should be OK, also 0,50mm^2. Thin wire produces lower capacitance.

On toroid we wind **4 x 4** to **6 x 4** turns of wire, connected as shown on the circuit diagram and picture. With the count we may slightly adjust the frequency range. Please, look at the SWR charts on the following page. *This kind of single coil balun is difficult to get working perfectly through the whole HF band.*

Serial capacitor **C1** is (optionally) used to compensate SWR on lower end: *the primary coil impedance is far to low on 1-5 MHz*. We used Wima FKP1 **3300pF 1250V**, or **3300pF 3kV** ceramic disc capacitors.

The best match on higher frequencies was tuned by adjusting inter-winding capacitance; i.e. gap between wires.

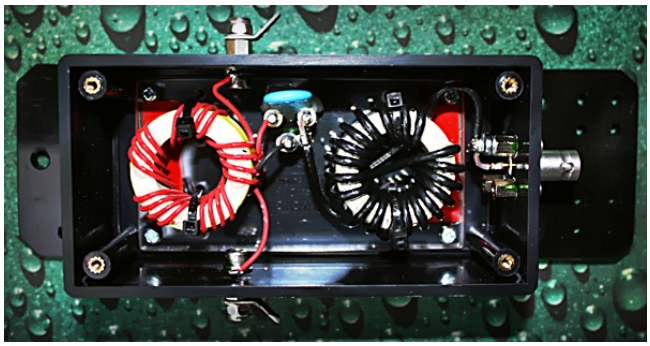
Typical Enclosure



This balun is boxed into ABS enclosure. *Do not use metal enclosure for high-impedance baluns !* Output connectors are 6,3mm Abiko terminals and the coaxial connector is a standard BNC female with flange. The enclosure may be potted with beeswax or epoxy.

Common Mode Choke (CMC)

This balun may need an external filter to prevent coaxial mantle radiation, especially with less symmetric antennas. You may want to install ferrite tubes over the cable, near the coaxial connector.
A preferred solution would be a wide band current choke, some details on author's web page. The following picture shows a 1:16 balun and coaxial CMC assembled into the same enclosure.



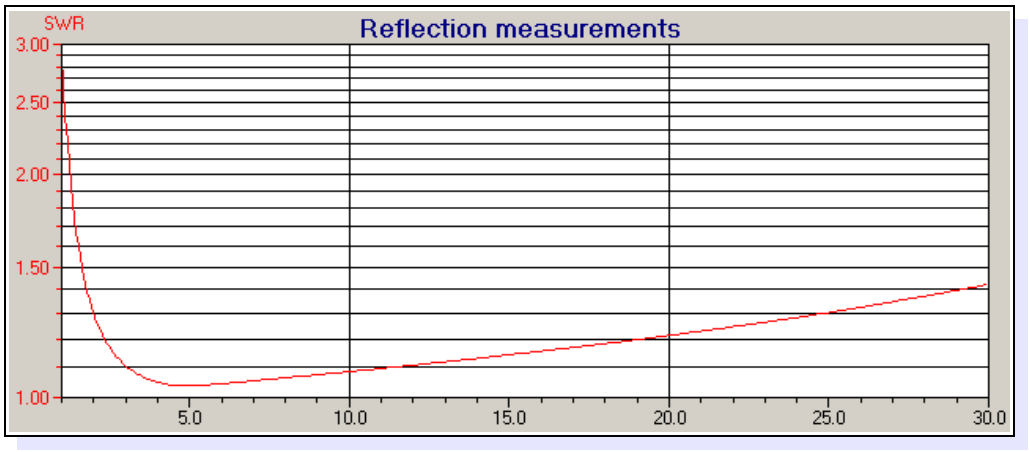
SWR measurements

We measured the following SWR results with Mini VNA Pro instrument. The 800Ω low-inductance load resistor (thick film) was connected directly across the short output wires. *The efficiency of this balun was not measured.*

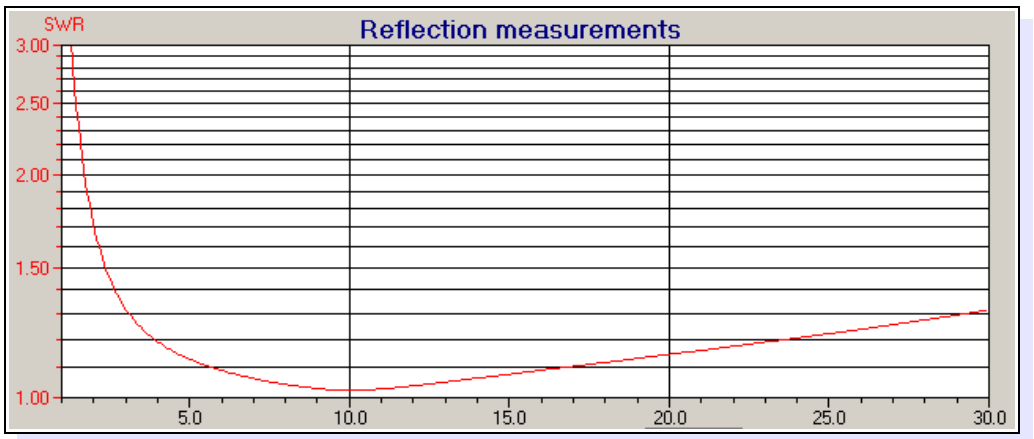
On charts you see that the perfect SWR range is rather narrow and you may only slightly adjust this range by chancing the winding.

This balun type is intended to use with high-impedance wide band traveling wave antennas, like V-beams, Rhombic and T2FD's. These antenna types may produce wide SWR deviation and then *you may have to use antenna tuner*.

6 x 4 turns



5 x 4 turns



4 x 4 turns