



Definitions used for Helmholtz Coils

Coil: also, **Magnetic coil**. Normally made with a suitable number of turns of isolated copper wire. A magnetic field is generated when an electrical current circulates in the wire. There are many types of magnetic coils, as solenoids for example, but the used in Helmholtz coils are thin ones, with windings of a relatively small cross-section as compared with the diameter of the coils.

Helmholtz coil: also, **Helmholtz pair**. It is a pair of identical thin coils, spaced out to get the most homogeneous magnetic field in a volume of space at its center, when same current circulates in both coils. It is typically constituted by two circular coils spaced out by a distance equal to its radius, though square, rectangular or polygonal coils can be also used. The most common purpose for Helmholtz coils is the generation of a known magnetic field, however these could be also designed for magnetic field sensing purposes, since a variable magnetic field induces a proportional variable voltage at the terminals of the Helmholtz coil.

Helmholtz coil-set: It is a ready to use assembly of Helmholtz coils, including its supporting structure and the wiring for the coils, with the terminal block for its connection to the external equipment. In depending on the number of axes on which a magnetic field is generated, coil-sets can be classified as follows:

- One-axis coil-set: with a pair of coils, to generate (or sense) a field along one direction. Also named 1-D Helmholtz coils (one-dimensional).
- Two-axis coil-set: with two orthogonal pairs of coils (four coils), to generate (or sense) a field along any of the two directions independently, or on a plane by vector addition of the two axes. Also named 2-D Helmholtz coils (two-dimensional).
- Three-axis coil-set: with three orthogonal pairs of coils (six coils), to generate (or sense) a field along any of the three directions independently, or along any direction on a plane by vector addition of two axes, or on any spatial direction by vector addition of three axes. Also named 3-D Helmholtz coils (three-dimensional).

1-D, 2-D or 3-D Helmholtz coils: See "Helmholtz coil-set".

Standard coil-set: Manufactured by Serviciencia in small batches to get our best quality/price ratio. Designed for general purposes. Several versions of different size are offered. We try to keep a stock of our standard coil-sets, or at least a relatively short delivery time.

Special coil-set: also, **Custom-made coil-set**. Designed and manufactured to fit the specific requirements of a customer, not fulfilled by the standard coil-sets. Examples are water-cooled coil-sets for relatively high fields generation; low inductance coil-sets for the generation of high frequency magnetic fields; coil-sets of square coils; high-power air-cooled coil-sets with thick section coils; coil-sets combined with magnetic shields; unusually large, or small, coil-sets; etc.

Optional accessories: Optionally, some pieces of related equipment can be supplied together with a Helmholtz coil-set. The most usual are: DUT (Device Under test) stands, to keep the DUT well positioned in the coils; non-magnetic pedestals for the larger coil-sets; power supplies to feed the coils with suitable currents; specific supporting fixtures; magnetic shields to enclose the coils.

Source: Serviciencia, S.L.U.

See: <https://www.si-gmbh.de/produkte/helmholtz-spulen/>