

Ferronato® - BM4-3000-3-A

A three-axis coil system of "Merritt" type, of three metres, to generate magnetic fields of very high homogeneity

- Of 3 metres side, nominally.
- Four square coils per axis.
- DC and AC operation.
- It can be made to operate at temperatures around zero Celsius and 100% relative humidity.
- After its final tests at factory, its is dismantled and transported in parts not larger than 0.4 x 1.6 x 1.6 m, allowing its carry-in through narrow doors and corridors.
- In the standard configuration, each axis has three identical circuits (three windings). Each circuit can generate to around 150 μT . Maximum field is 450 μT per axis using the three circuits. The three circuits can be combined in different ways by wiring these in parallel or in series. Other windings are available optionally.

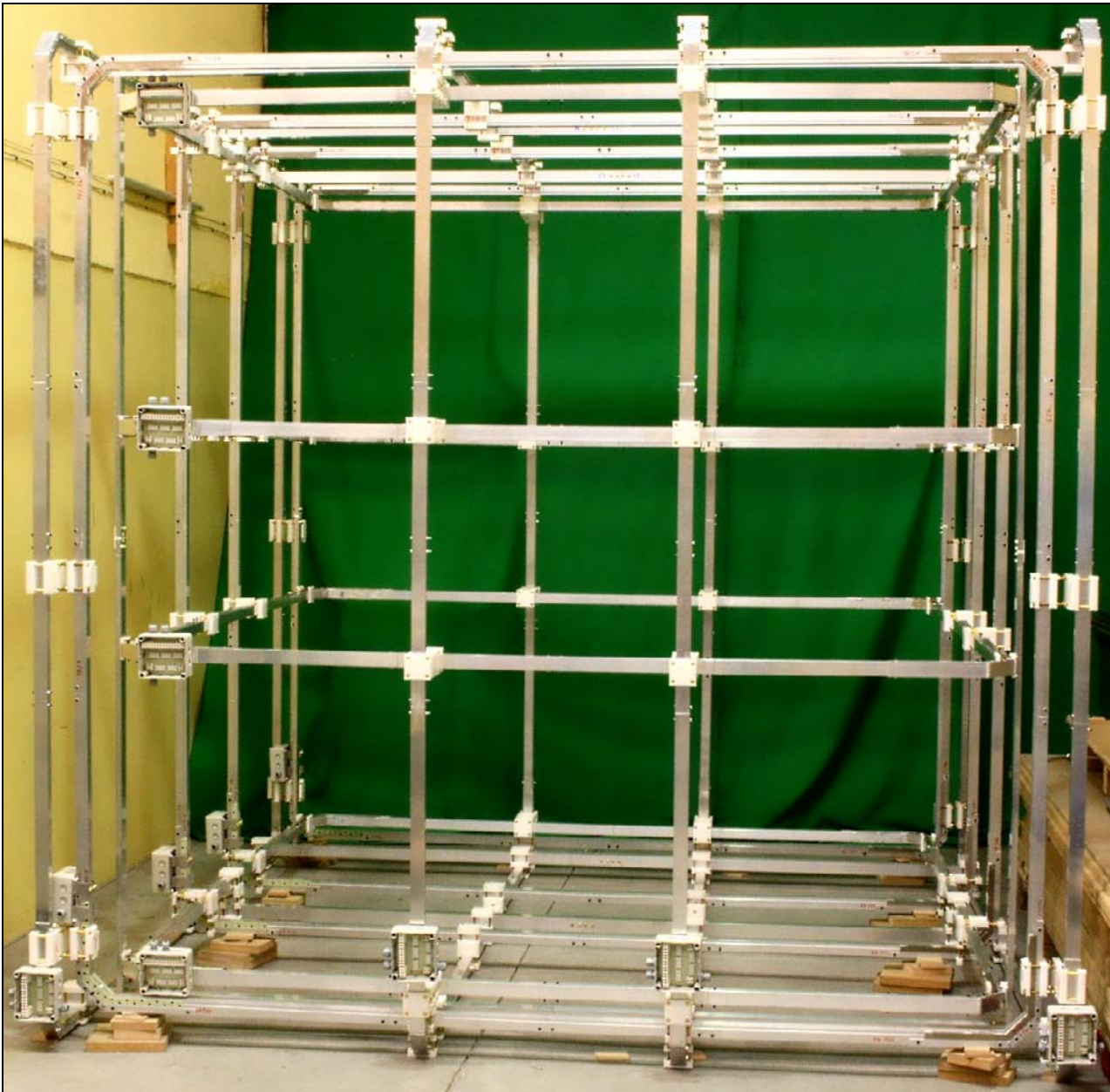


Fig. 1: A photo from a preliminary assembly at our facilities.

General specifications

Coil type	Merritt coils, of four coils per axis.
Nominal dimension	Three metres by side.
Maximum generated field, each axis	Around 450 μ T, steady way. Using the three circuits simultaneously.
Maximum current, each axis	10 A, steady way, each of the three independent circuits on each axis. To 30 A for the three circuits in parallel wired, each axis.
Field homogeneity (It is assumed a negligible background of magnetic gradients)	$\pm 1\%$ (10,000 ppm) in a cubic volume of side around 1,500 mm. $< \pm 0.01\%$ (100 ppm) in a cubic volume of side 200 mm.
Nr. of turns of each of the two outer coils	26, each of the three circuits.
Nr. of turns of each of the two inner coils	11, each of the three circuits.
Isolation Voltage	Maximum voltage in between windings and coil forms: 250 V DC.
Wiring of each axis	The four coils are in-series wired (same current in each coil).
Connectors	Each coil have attached a terminal box, or junction box (see Fig. 1), in which interior there is a terminal block of 12 ways, with twelve M4 brass screws (see Fig. 5). The terminal block allows wiring among the coils and in between the coil system and the power supplies.
Materials	Windings in flexible cable of 2.5 mm ² conductor section; with isolation of high quality, suited to operate to 205 °C and in aggressive atmospheres. Coil-forms and reinforcing beams in 6063 aluminium alloy. Brackets and joining pieces in POM ("Delrin", Acetal) plastic, with brass bolts and nuts. Junction boxes in Polypropylene, with sealing gaskets in TPE and terminal blocks in POM, with brass screws. Coil feet in Polypropylene.
Maximum dimensions	3,315 x 3,346 x height 3,267 mm, or 3,282 mm with feet. See Fig. 2.
Operating environment	Ambient temperatures from -10 to 40 °C. Relative Humidity from 0 to 90 % RH (optionally to 100 % RH).
Maintenance	No maintenance is expected to be necessary, excepting perhaps a surface cleaning after one or two years.
Included accessories	- Twelve feet to be placed under de coils, providing an space of around 10 mm in between the coil system and the floor. - A set of purposed plates (shims) to be placed under the feet when needed, for proper system levelling.
Optional accessories	- Stands for device under test (DUT), of several types. - Elevated flooring. - Extra circuitry to adjust the field of each single coil, purposed to cancel unwanted gradients. - Others under demand.
Weight	Around 600 kg.
Warranty	One year.

Specifications per axis

	X axis	Y axis	Z axis (vertical)
Mean side (electrically effective) ± 10 mm (a 20 °C) [mm]	3,180	3,000	2,820
Field/Current ratio, ± 1 % [μ T/A] Each of the three circuits	14.6	15.5	16.5
Resistance/ 20 °C, $\pm 3\%$ [Ω] Each of the three circuits	7.3	7.0	6.6
Inductance, ± 5 % [mH] Each of the three circuits	24	22	16

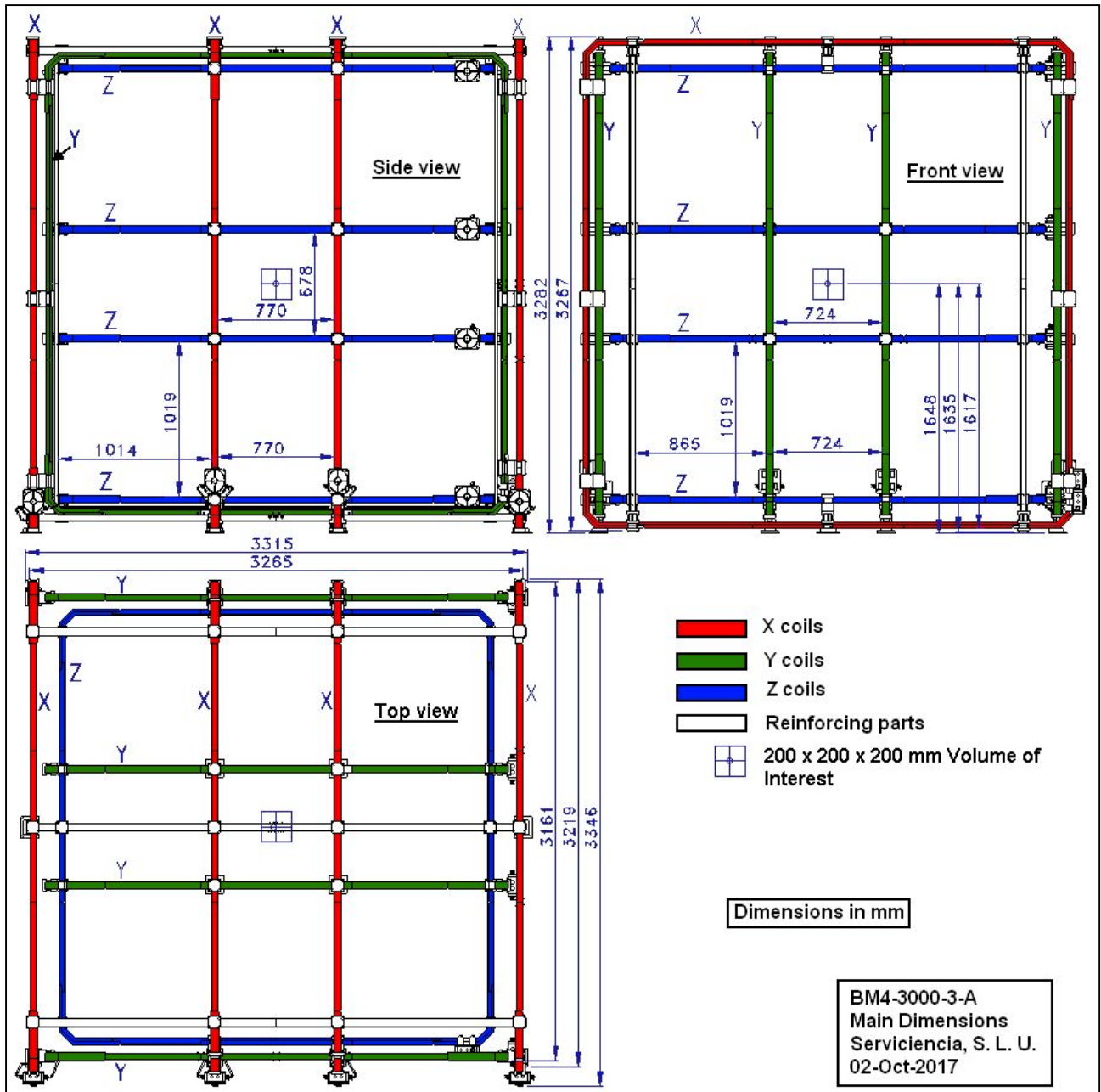


Fig. 2: Main dimensions.

- These specifications could suffer minor modifications in future -

Optional gradient adjustment circuits

In order to cancel unwanted magnetic gradients to a very high degree, both from the local Earth's field (background) and from the generated fields, the following circuitry can be added.

Variable resistances can be added in parallel to each circuit on each coil, in order to reduce a little bit the field generated by each circuit in the coil, so producing tiny gradients as needed.

Besides the above, three extra cable loops (single turns) are included in each coil of each axis. Then, a very small current can be run in any loop in order to generate a tiny magnetic gradient, by means of simple circuitry with fixed and variable resistors, with an independent and simple power supply (optional). One loop is purposed to cancel background gradients, while the other two are to cancel gradients in the generated fields.

That resistor circuitry would be added to a coil just if necessary to get the needed field homogeneity in the Volume Of Interest (VOI).

A more detailed description can be provided by a separated document when needed.

Optional desiccant in terminal boxes

In the standard configuration, each coil has a terminal box (or junction box) for wiring. Each box is watertight and airtight, rated as IP67.

For aggressive atmospheres, as the saline ones near seacoast, or with Relative Humidity to 100 % in caves, for instance, each box can be equipped with a container with environmentally friendly desiccant (silica-gel). The desiccant turns from Orange to Brown/Black when saturated, which can be checked from outside in order to know when it is necessary to be replaced by fresh silica-gel. Cables go in/out through glands that are also environmentally sealed. See Fig. 4.

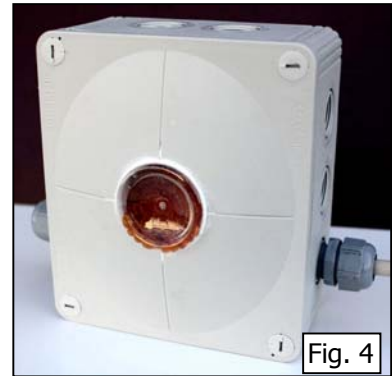


Fig. 4

Other optional items

- Elevated flooring
- DUT stand, of different types, as needed. One with tabletop of 1.5 x 1 m, placed at its maximum height, is depicted at right (Fig. 5).
- Other accessories as required.



Fig. 5

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