

Accessory for Helmholtz coils - Stand with spherical air bearing Ferronato® - **ULTAS-1**

- Articulated stand of ultra low torque ("frictionless"), non-magnetic, for Device Under Test (DUT) to about 10 kg in weight (besides the needed counterweights).
- Purposed to simulate rotations under microgravity condition.
- Specially designed to test small satellites (for instance, their attitude control based on Earth's magnetic field), it could be also useful for navigational devices and other applications.
- Originally conceived for our BH1300-3-A/C coils, it can be used with any other suitable set of coils.
- Non-metallic construction without effect on some possible DUT related RF signal.
- It can be tilted to 60° on most directions (excepting where counterweight collides with the stand).
- An entry-level system, which can be easily modified or improved by the User.

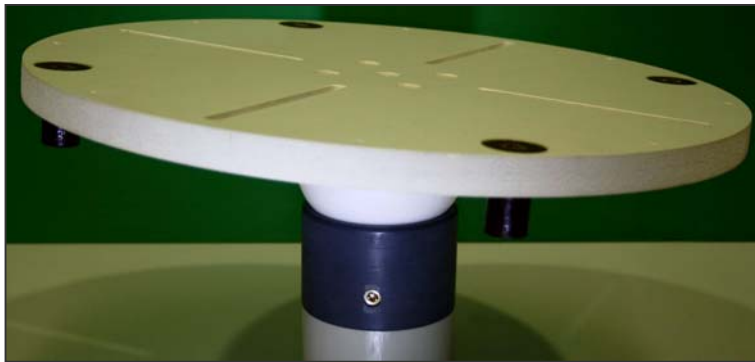


Fig. 1: A view of ULTAS-1.



Fig. 2: A bottom view of the socket.

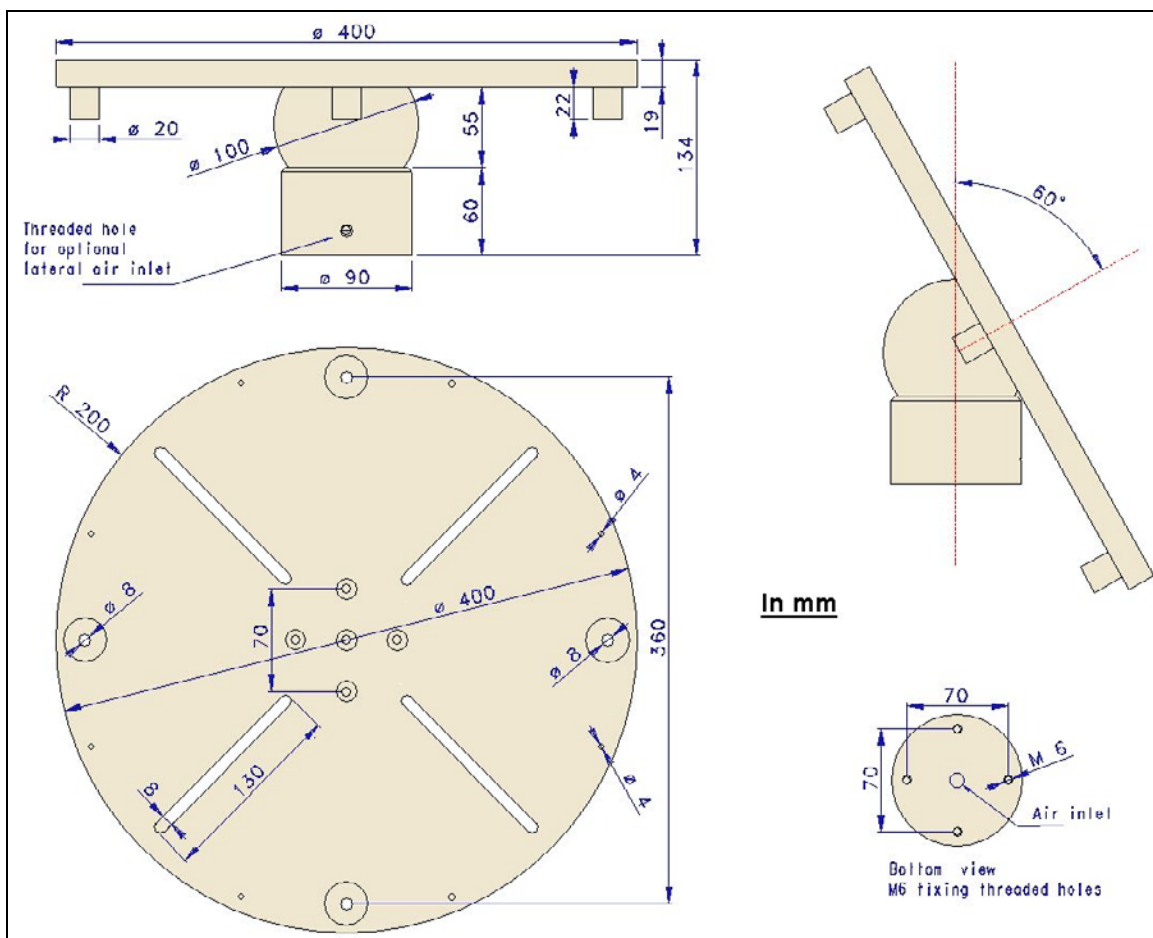


Fig. 3: Main dimensions.

Description

The ULTAS-1 is composed of the frictionless ball and socket articulation, by compressed air, with a circular table fixed to the ball, as can be seen in Figures 1 and 3. The table has four reinforced holders with holes of 8 mm in diameter to put up the rods with the weights, as well as four grooves of 8 mm, with a length of 130 mm, in cross, to fix the DUT. It has also eight holes of 4 mm distributed along its perimeter, with the purpose to place small weights to get a fine adjustment of the equilibrium of the mobile assembly.

A simple system with counterweights allows bringing the centre of gravity of the mobile assembly very close to the centre of the ball, by what the torque needed to tilt the DUT on vertical planes is reduced to the minimum possible. Each rod with a weight can be moved up or down and locked in place by the plastic nut on top. That nut acts as a stop to keep the rod with the weight at the wanted height.

A kit of threaded rods (M8) is offered as optional accessory, as well as some weights of lead.

The base with the concave spherical surface (the socket) allows placing the air inlet either laterally or centred in beneath, as it is shown on Fig. 2 and 3. It is supplied with a threaded plug in the unused inlet hole (normally the lateral one).

Maximum recommended total load: 25 kg, equivalent to one DUT of about 10 kg, with about 12 kg in counterweights to equilibrate for a minimum torque on vertical planes.

Airflow and pressure: For a total load of 25 kg about 15 litres/minute are required, with a pressure of 1.2 bar. Lower pressures are required for smaller loads, while flow should remain around 15 l/min.

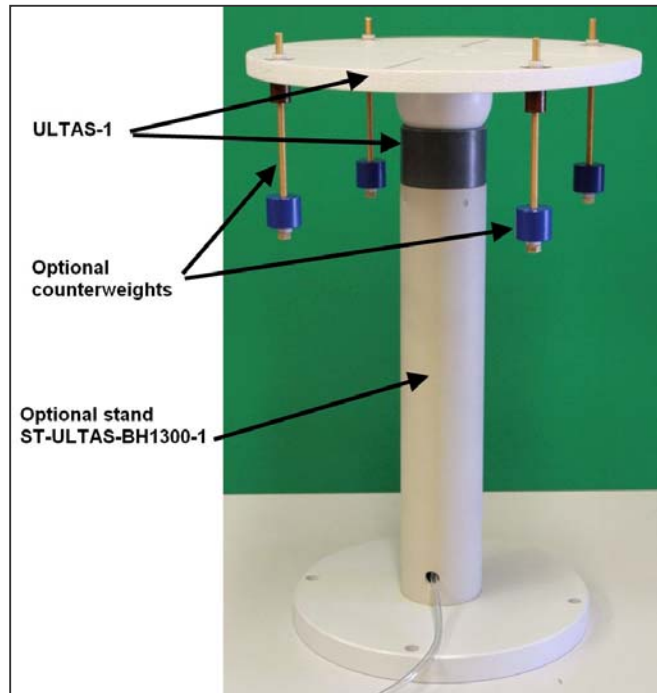


Fig 4: ULTAS-1, with weights and stand.

Optional accessories

- Set of rods A, for counterweights

Set of four brass rods of 8 mm in diameter by 200 mm in length (M8 x 200), M8 x 1.25 threaded, with the nuts in brass and Nylon. These can be seen in Fig 4 and 6.

Maximum advisable load for a rod when totally extracted: 3 kg.

- Set of weights A, of 300 g

Set of four cylindrical lead weights, of 285 grams each one. These can be seen in use in Fig. 4 and 6.

- Set of weights B, of 740 g

Set of four cylindrical lead weights, of 740 grams each one. These can be seen in use in Fig. 9.

- Set of weights C, of 1580 g

Set of four cylindrical lead weights, of 1580 grams each one. These can be seen in use in Fig. 9.



Fig. 5: Set of counterweights.

The counterweights can be used combined, by placing two or three on same rod, as it can be seen in Fig. 9.

Assembly temporary stand

It is a cylinder in strong polypropylene, of diameter 250 x height 230 mm, with openings of 150 mm in diameter on its side to access with the hands, purposed to facilitate the installation of the counterweights and other operations on the ULTAS-1. See Fig. 6.

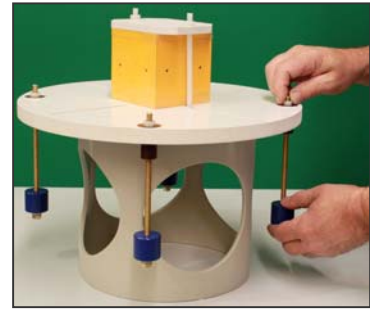


Fig. 6: Temporary stand.

ACU-ULTAS-2 - Air conditioning unit

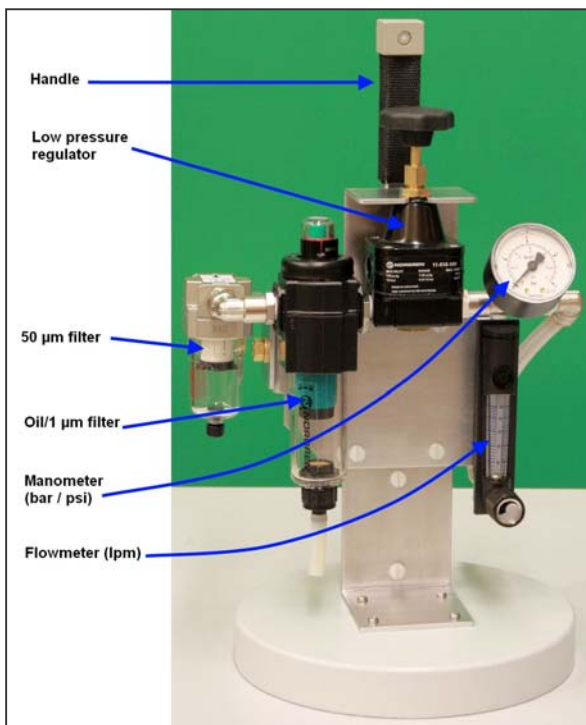


Fig. 7: The unit ACU-ULTAS-2.



Fig. 8: Back view of ACU-ULTAS-2.

It is an improved version of the former ACU-ULTAS-1. It can be seen in Fig. 7 and 8.

It should be placed as near as possible to the DUT stand. Its "magnetic signature" is very low and in many cases it can be placed also inside de coils, next to the stand of the ULTAS-1. At 1 metre or more, its magnetic influence is not noticeably in practically any application.

It is constituted by a 5 µm air filter at the intake, followed by a 1 µm/oil filter, a precision low pressure regulator, a manometer to measure the output pressure and a flowmeter.

It allows a fine adjustment of pressure and airflow, keeping a constant pressure at the output. Maximum input pressure: 10 bar (1000 kPa).

ST-ULTAS-BH1300-1 - Stand

Purposed to use the ULTAS-1 in our coils BH1300-3-A. With a total height of 490 mm, it allows to centre the DUT in the coils. See Fig. 4 and 6.

It has four holes on its base to fix it by M6 screws.

The air hose enters by a hole near its base and run through its interior.

Fully made in strong polypropylene.

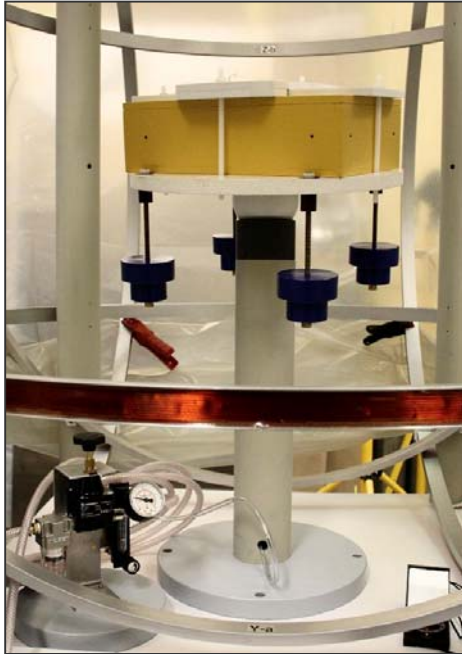


Fig. 9: Assembly with a mock-up of CubeSat 6U, in BH1300-3-A coils.

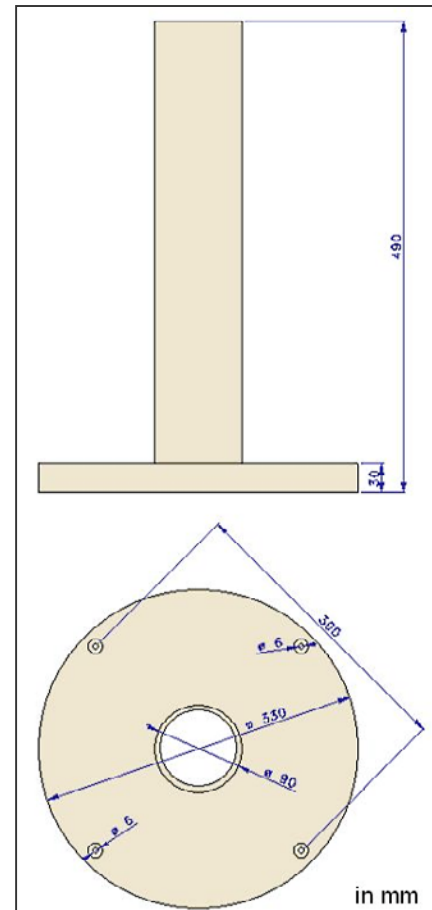


Fig. 10: ST-ULTAS-BH1300-1 dimensions.

The ST-ULTAS-BH1300-1 stand is purposed to centre, in the coils BH1300-3-A, DUTs of 100- 200 mm in height, as a CubeSat 1U (of one unit) on any of its axes, for instance, or as a CubeSat 3U (three units) on two of its axes. **A taller DUT, as a CubeSat 3U, or one of 6U, placed with its Z-axis (larger dimension) vertical, should need a stand lower in some, fixed or of variable height, in order to keep all the DUT in the volume of higher field homogeneity of the coils.**

Note about the counterweights and the CubeSat

In general, when larger the satellite to be tested the heavier the counterpoise to be used. However also the position on which the satellite would be tested would have its influence, to the extent that the DUT position on the table could be a limiting factor. A too large satellite, or one placed with its larger dimension perpendicular to the table, could exceed the advisable counterweight, taking into account the strength of the table and of the rods supporting the weights. Some examples follow:

- *CubeSat 1U: It can be tested on any of its axes.*
- *CubeSat 2U: It can be tested on any of its axes.*
- *CubeSat 3U: It can be tested on two of its axes. Perhaps it could be tested on its 3rd axis too.*
- *CubeSat 6U: It can be tested on one of its axes. Perhaps it could be tested on a second axis. Most likely it could not be tested with Z-axis perpendicular to the table of the ULTAS-1, because it should need an excessive counterpoising weight.*
- *CubeSat 12U: Likely it could be tested on one of its axes. It could not be tested on its other two axes because it should need an excessive counterweight.*

Besides the problem of excessive weight to get the equilibrium, the cases of 3U, 6U and 12U in where the Z-axis is perpendicular to the table of the ULTAS-1, have also the problem that with the stand ST-ULTAS-BH1300-1 the CubeSats would move in a magnetic field of relatively poor homogeneity. A lower stand would be needed in those cases, to keep the DUT better centred.

DUT fixing brackets (Fig. 11)

A set of boards in White foamed PVC, with rods and M8 nuts in Nylon, to fix the DUT to the table by using the grooves on it. The following composes the set:

- One small board for CubeSat 1U
- One large board for CubeSat 3U and 6U.
- One medium-sized board, to be used together (crossed) with the large one, for CubeSat 6U.
- Two M8 x 160 mm threaded Nylon rods, with two nuts each.
- Two M8 x 180 mm threaded Nylon rods, with two nuts each.

These brackets can be used for other DUT's else than CubeSats.



Fig. 11: Brackets.



Fig. 12: ULTAS-1 with the optional accessories (Excluding the Yellow CubeSat mock-up)

Air compressor

When convenient to the Customer, some suitable compressor could be also offered.

Other accessories

Besides the described in above, the customer can ask us about any other accessory as needed.

- The specifications in here could suffer modifications in future -

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