MAG SOAR superconducting magnetic bearings prevent contact, friction and wear. They do not need lubrication and can operate in vacuum, cryogenics and extreme conditions with maximum efficiency.

This patented superconducting bearing technology achieve unprecedented loads and stiffness capabilities and minimum rotational losses.

MAG SOAR provides turnkey superconducting bearings tested at cryogenic temperatures. Detailed design, manufacturing, testing and magnetic characterization are among our capabilities.

**APPLICATIONS**

- **Flywheels**
- **Rotational and Linear Bearings**
- **Cryostat suspensions**
- **Vibration isolation**
- **Extended life bearings**
- **Feed-through power transmission**

<table>
<thead>
<tr>
<th>Thrust, Radial Load and Mixed configurations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Load</strong></td>
</tr>
<tr>
<td>Up to 100 kg</td>
</tr>
<tr>
<td><strong>Maximum speed</strong></td>
</tr>
<tr>
<td>Up to 25 000 rpm</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
</tr>
<tr>
<td>Up to 99.9%</td>
</tr>
<tr>
<td><strong>Maintenance free</strong></td>
</tr>
<tr>
<td><strong>Temperature range [4 to 77k]</strong></td>
</tr>
<tr>
<td><strong>Very low outgassing</strong></td>
</tr>
</tbody>
</table>

**MAG SOAR**

Superconducting Magnetic Bearings

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www.magsoar.com
Superconducting Magnetic Bearings

**Journal Bearings**
Journal bearings provide maximum axial and radial stiffness minimizing weight and cost.

**Thrust Bearings**
Thrust bearings provide maximum load capacity and can be easily designed to operate through-wall, isolating two different environments.

**Hybrid Bearings**
Hybrid bearings provide a mixture of the advantages of both journal and thrust bearings in a compact and robust configuration.

**Linear Bearings**
Linear motion bearings are also available. Linear bearings provide a friction-free solution for high precision positioning in cryogenic and vacuum environments.

High load conveyors and through-wall transportation lines can be customized under request.

**Summary of Bearings Performance**
- **AXIAL STIFFNESS per unit mass**
- **RADIAL STIFFNESS per unit mass**
- **Load Capacity**: Up to 100 kg
- **Travel distance**: Up to 5 m
- **Run outs**: Below mrad range
- **Active position control**: Available up to the nm range

Other configurations are available. Please contact info@magsoar.com for a customized design for your application.
MAG SOAR owns a High Vacuum Chamber with a High Power Cryohead.

The facility is provided with a unique set-up which allows testing of superconducting bearings and suspensions, thermal-vacuum cycling, bake out magnetic pollution levels and current density evaluation.

### Vacuum chamber

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>500 mm</td>
</tr>
<tr>
<td>Height</td>
<td>1000 mm</td>
</tr>
</tbody>
</table>

### Pressure

- **Pressure range:** 1·10⁴ to 1·10⁻⁸ mbar

### Temperature

- **Temperature range:** from 373 K to 4 K

### Linear actuator capacity

- **Max. force:** 600 N
- **Max. frequency:** 100 Hz
- **Max. stroke:** 15 mm

### Rotatory actuator capacity

- **Max. speed:** 60,000 rpm
- **Max. torque:** 50 Nm

### UNIQUE SUPERCONDUCTING BULKS

MAG SOAR in collaboration with its partner CAN SUPERCONDUCTORS supply special YBaCuO and other high temperature superconductor bulks with up to twice the load capability and stiffness of their competitors in the market, saving weight, space and cooling power for your application.

To know more about this product line, please ask our engineering department.

http://www.can-superconductors.com/

MAG SOAR has a large and unique experience in magnetic levitation and superconducting systems. Thanks to an intensive research during the last years, we have gathered a unique know-how on the technology which allow us to reach fields where never any other company has been, like space.

**Vibration isolation and thermal disconnect:**

MAG SOAR supplies the European Space Agency with a suspension for the ATHENA large mission to be launch in 2028 that would eventually be installed on the cryostat of the ESA ATHENA mission, an advanced X-ray telescoped designed to address the Cosmic Vision gas structures.


**Superconducting Magnetic Harmonic Drive:**

First Magnetic Gearbox supported by High Temperature Superconducting Bearings.

http://www.magdrive.eu/

**Superconducting Nanopositioner Actuator:**

MAGSOAR has being part of the development of a prototype of a nanopositioner for far infrared interferometry in the ESA/JAXA Spica Mission. The prototype achieved unprecedented resolution for this short of technology.
Fruit of our unique experience, we have provided numerous scientific contributions to improve knowledge in the field. Also several developments have been patented and are currently exploited:

- **Performance of Magnetic-Superconductor Non-Contact Harmonic Drive for Cryogenic Space Applications**, Machines 2015

- **Improving Resolution and Run Outs of a Superconducting Noncontact Device for Precision Positioning**, IEEE-ASME TRANSACTIONS ON MECHATRONICS, 2015

- **Dynamics of a Superconducting Linear Slider**, JOURNAL OF VIBRATION AND ACOUSTICS, 2015


- **Superconducting Noncontact Device for Precision Positioning in Cryogenic Environments**, IEEE-ASME TRANSACTIONS ON MECHATRONICS, 2014

- **Force relaxation and hysteresis in a frictionless superconducting magnetic bearing**, INTERNATIONAL JOURNAL OF SURFACE SCIENCE AND ENGINEERING, 2014


- **Non-contact linear slider for cryogenic environment**, MECHANISM AND MACHINE THEORY, 2013

- **Alignment effect between a magnet over a superconductor cylinder in the Meissner state**, JOURNAL OF APPLIED PHYSICS, 2011

**Vídeos**

[https://www.youtube.com/watch?v=l_2JbDd-NyY](https://www.youtube.com/watch?v=l_2JbDd-NyY)

[https://www.youtube.com/watch?v=2EaZCaH0t78](https://www.youtube.com/watch?v=2EaZCaH0t78)