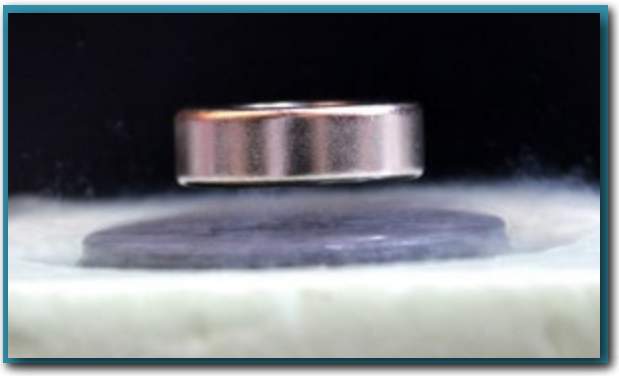
SUPERCONDUCTING MAGNETIC BEARINGS

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.

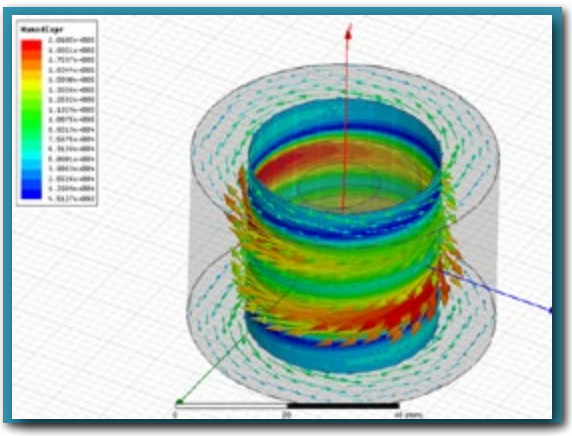
MAG SOAR provides **turnkey superconducting bearings** tested at cryogenic temperatures. Detailed design, manufacturing, testing and magnetic characterization are among our capabilities.

Thrust, Radial Load and Mixed configurations	
Load	Up to 100 kg
Maximum speed	Up to 25 000 rpm
Efficiency	Up to 99.9%
Maintenance free	
Temperature range [4 to 77k]	
Very low outgassing	



APPLICATIONS

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



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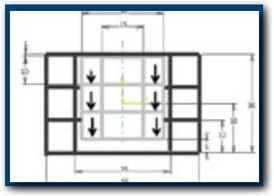
SUPERCONDUCTING MAGNETIC BEARINGS

BEARING CONFIGURATIONS

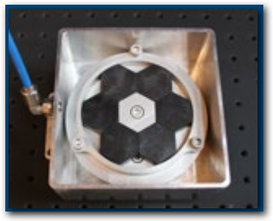
ROTATIONAL JOURNAL BEARINGS

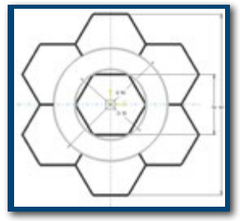
Journal bearings provide maximum axial and radial stiffness minimizing weight and cost.



ROTATIONAL THRUST BEARINGS

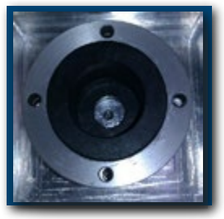
Thrust bearings provide maximum load capacity and can be easily designed to operate through-wall, isolating two different environments.





ROTATIONAL HYBRID BEARINGS

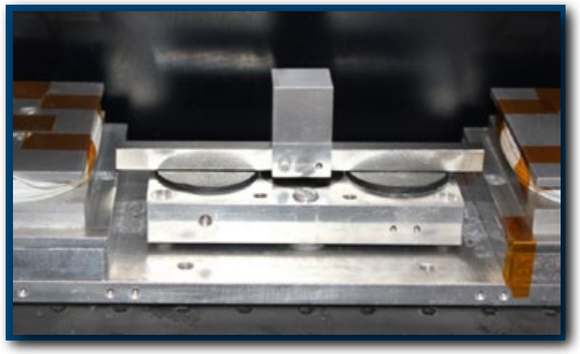
Hybrid bearings provides a mixture of the advantages of both journal and thrust bearings in a compact and robust configuration.



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.



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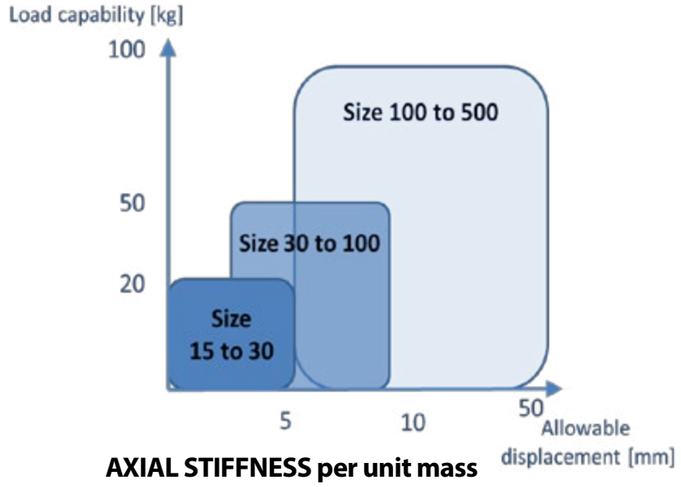
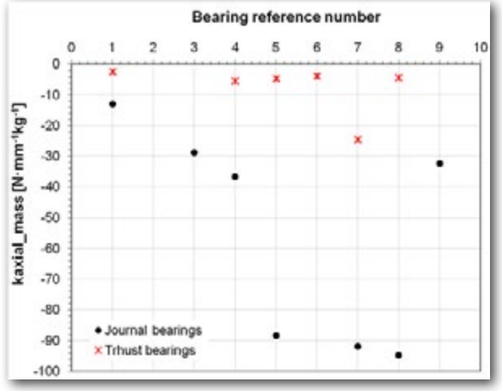
SUPERCONDUCTING MAGNETIC BEARINGS

SUMMARY OF BEARINGS PERFORMANCE(measured at 77k)

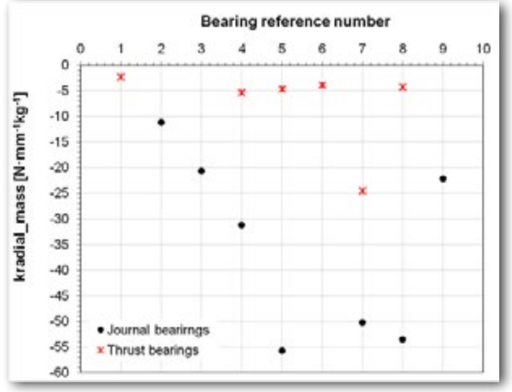
ROTATORY BEARINGS



AXIAL STIFFNESS per unit mass



RADIAL STIFFNESS per unit mass



LINEAL BEARINGS

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.

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SUPERCONDUCTING MAGNETIC BEARINGS

TESTING FACILITIES

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.

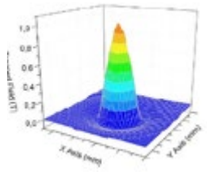
Vacuum chamber	Ø500, h1000mm
Pressure	from 1·104 to 1·10-8 mbar
Temperature	from 373 K to 4 K
Linear actuator capacity	
Max. force	600 N
Max. frequency	100 Hz
Max. stroke	15 mm
Rotatory actuator capacity	
Max. speed	60.000 rpm
Max. torque	50 Nm

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

can superconductors



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

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SUPERCONDUCTING MAGNETIC BEARINGS

PREVIOUS EXPERIENCE AND PROJECTS

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.

http://www.magsoar.com/news/another-step-forward-for-levisolator/

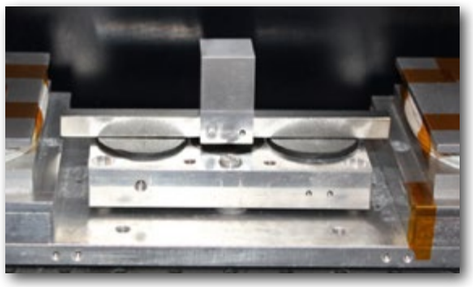
Superconducting Magnetic Harmonic Drive:

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.



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Superconducting Magnetic Bearings

Related Papers

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
- **Design and analysis of a non-hysteretic passive magnetic linear bearing for cryogenic environments**. PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART J-JOURNAL OF ENGINEERING TRIBOLOGY, 2014
- **Characterization and Improvement of Axial and Radial Stiffness of Contactless Thrust Superconducting Magnetic Bearings**, ENGINEERING TRIBOLOGY, 2014.
- **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
- **Engineering and performance of a contactless linear slider based on superconducting magnetic levitation for precision positioning**, Mechatronics, 2013.
- **Stable thrust on a finite-sized magnet above a Meissner superconducting torus**, JOURNAL OF APPLIED PHYSICS, 2013.
- **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=I_2JbDd-NyY

https://www.youtube.com/watch?v=2EaZCaH0t78

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