# OctoMag

MagnebotiX中型磁场梯度控制系统

MagnebotiX OctoMag由磁场产生单元、电力电子设备和控制软件用户界面(MBX Pro)组成。该系统能够在直径约为50毫米的球形工作空间内产生任意方向的磁场和场梯度。因此，该系统可以悬浮和控制粘性液体中的磁性物体，具有5个自由度(3-DOF位置，2-DOF方向)。时变信号可以驱动磁性物体的旋转或步进驱动。使用我们的MBX Pro软件及其基于ros的架构，可以采用多种控制策略，从手动开环控制到定制解决方案，用于沿预定义路径对磁性物体进行全自动伺服。OctoMag带有一个外部框架，可以在实验室中轻松定位。内部，自成一体的发电机组可以倾斜0度(如图所示)，30度或45度，以方便实验进入磁性工作空间，或者可以独立放置在实验室的外部框架。
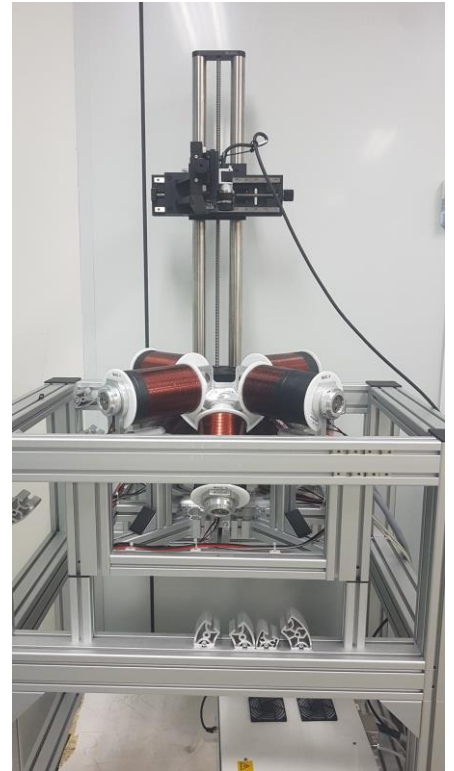
场产生和控制模式

• 磁场控制:在工作空间内产生任意方向的磁场矢量，用于磁化铁磁性物体。可以自由移动的磁性物体将与外部磁场对齐。

• 梯度控制:对磁化物体施加一个力，使物体沿磁场梯度向任意方向移动或使物体悬浮在液体中

• 旋转控制:可控制地改变磁场方向，对磁化物体施加转矩，使磁化物体偏转时重新定向，移动时随外场自由旋转

• 用户特定的控制:定义场和梯度作为时间的函数使用标准的数学符号:方波，锯齿，处理场矢量，指数递减-如果你可以定义它的数学，你可以产生与我们的新软件。

建议应用方向

• 通过对空气或液体中的小磁性物体施加磁力和力矩的影响来研究磁微致动策略
• 利用无系留的磁性末端执行器对液体中非磁性物体进行机械操作和提取
• 小物体与无系留磁末端执行器相互作用的力学特性研究
• 机械生物学研究在器官或小动物水平上测量对小的、不系绳的磁铁的反应，如测定体内玻璃体的粘弹性。
• 导尿管指导医疗干预技术的发展(如全自动全视网膜光凝、视网膜下注射)

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System Components

MagnebotiX OctoMag magnetic field and gradient generation unit

- Maximum working volume diameter: 5 cm
- Max. magnetic field strength (center): 50 mT in any direction
- Max. magnetic field gradient (center): 2 T/m
- Dimensions (field generator) W x D x H: 560 mm x 560 mm x 390 mm
- Weight (field generator unit) 125 kg
- Dimensions (outer frame) W x D x H: 640 mm x 940 mm x 1350 mm
- total weight: 180 kg
- inclination angle of field generation unit: 0˚, 30˚ (shown), 45˚
- The OctoMag magnetic field generator has no moving parts and can be used over a wide range of temperatures
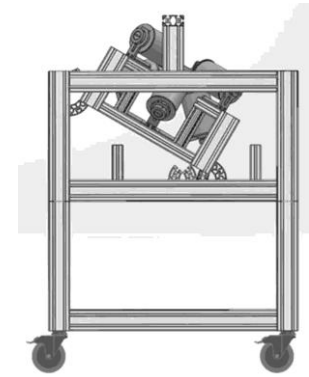
MagnebotiX extended power unit (ECB-820-ex)

- Number of channels: 8
- Max. current per channel: 18 A
- Max. voltage per channel: 96 V
- Max. magnetic field frequency: 10 Hz
- Max. power consumption: 2016 W
- External power requirements: 110 - 240 VAC / 50 - 60 Hz
- Dimensions (W x D x H) : 450 mm x 330 mm x 175 mm
- Weight: 12 kg
- Connection to control computer: Ethernet

The control computer and MBX pro software are included with the system.

System safety features: over-temperature and over-current monitoring of all coils; controller shutdown upon loss of communication with coil unit; external emergency shutdown switch.

The following are compatible with the system but not included

- Microscope or optics are chosen according to the experiments to be performed. Dissecting microscopes or long working distance zoom tubes are frequently used. A basic mounting platform is provided.
- Basler USB3 cameras are compatible with our MBX pro software (plug-and-play). Tested products include Basler USB3 ACE or Pulse series. Users can interface their own cameras through the open ROS environment if desired
- A computer monitor is not supplied with the system. We recommend use of a 24" monitor.
- SpaceNavigator (3DCONNEXION), PlayStation3 controller (input is provided to the MBX pro control software for open loop control).

All specifications are subject to change without notice.