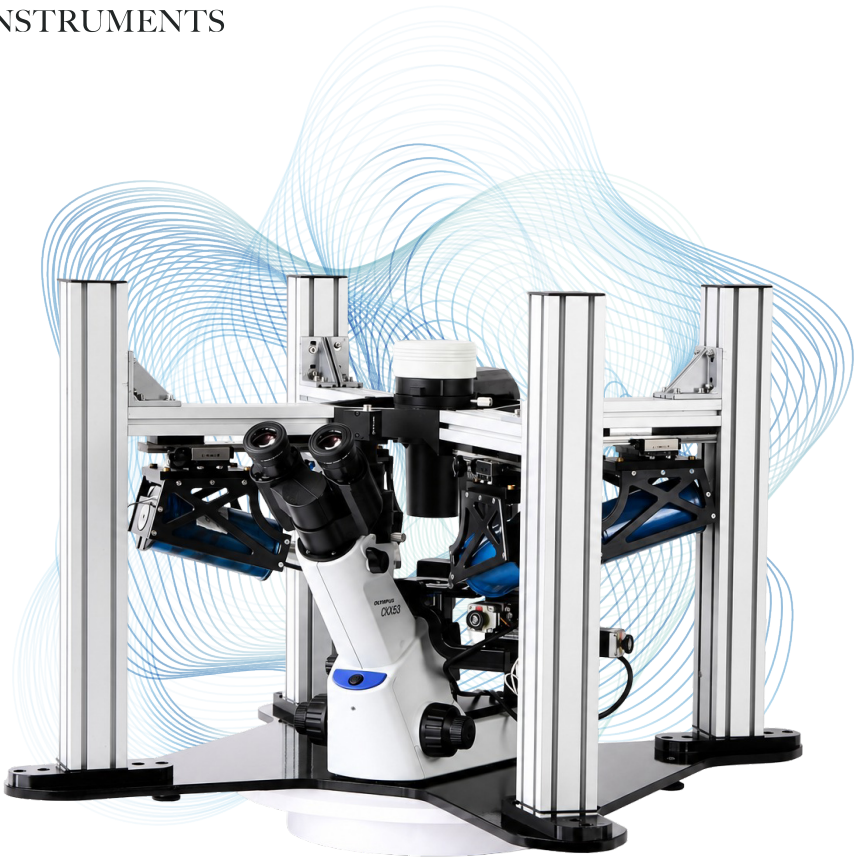




Magneto- & Bacteriodrome

www.mag-instruments.com

Digital microscopes with integrated magnetic field

Magneto- and Bacteriodromes are integrated optical systems with comprehensive magnetic field control.

Observe the influence of variable magnetic fields on magnetic compounds and organisms. Manipulate microrobots, magnetotactic bacteria, colloidal nanoparticles, and more.

Key features

Optical system and digital imaging

Each Magneto- and Bacteriodrome combines an application-specific optical system, such as an Olympus inverted microscope, a Keyence zoom lens, or a custom setup, with a digital camera for observing microscopic particles, organisms, and magnetic structures.

Integrated magnetic field generators

A built-in magnetic field source surrounds the microscope's observation area, enabling precise control over field intensity and direction.

Precise sample movement

A non-magnetic motorised stage allows for smooth control of the sample's location.

Customisable for diverse applications

Whether used in biomagnetism or in microrobotics to control magnetic microrobots, or in material science research, we offers full customisation of optical components and magnetic field sources to meet your specific requirements.

Advanced control software

The software provides advanced 2D and 3D field control, including programmable field orientation, variable-frequency rotation, and axis-angle control of 3D rotations. It also supports vision processing, passive and active motion tracking, video recording, and more

Setup examples

Digital camera

Camera for image processing inside the magnetodrome control software.

Magnetic field source

Integrated Helmholtz coil setup to generate uniform magnetic fields. Field direction can be adjusted in two or three dimensions depending on the coil setup.

Custom stage

Static or motorised stage to control the position of the specimen.

Inverted optical microscope

Olympus CKX53 with 4x, 10x, 40x magnification (or custom solutions).

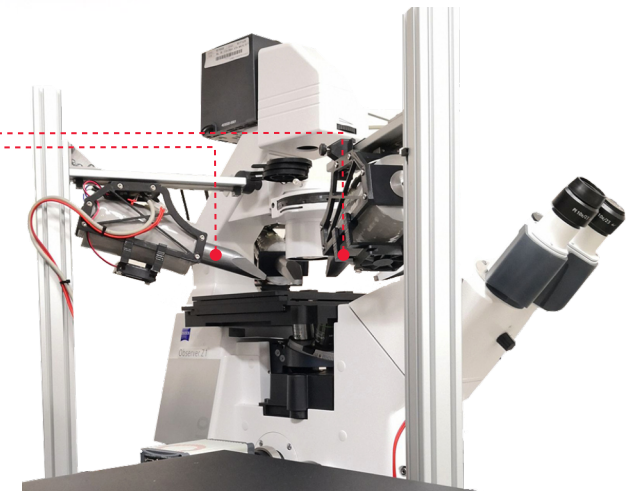
Bacteriodrome

Magnetic field source

Four adjustable electromagnets to generate uniform or gradient magnetic fields.

Control Electronics

USB interface for PC connection



Magnetodrome (custom setup)

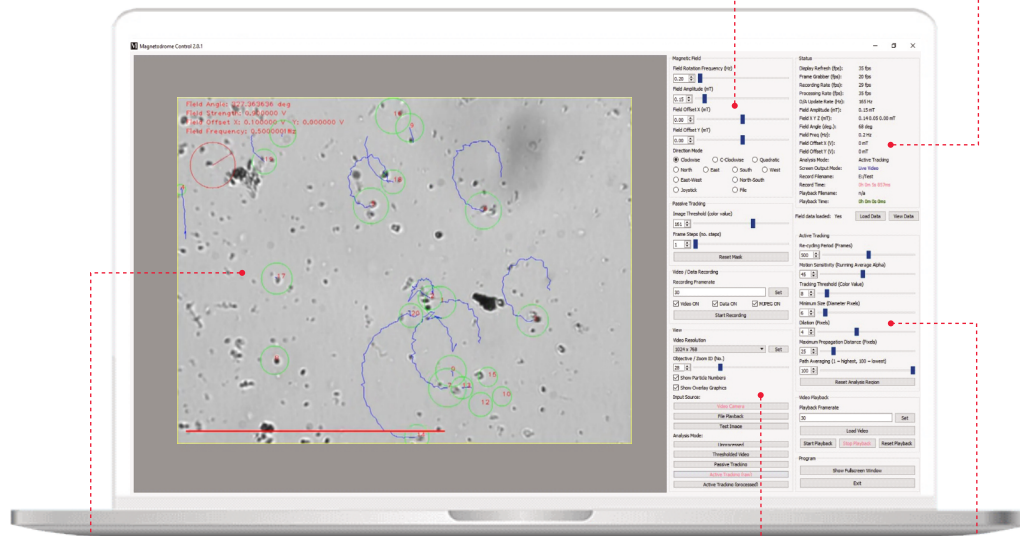
Comprehensive software for real-time image processing and precise magnetic field control

Magnetic Field settings

Flexible control of the magnetic field strength and direction, including circular field rotation, variable frequency and more.

Status bar

Live view of all relevant system parameters.



Video features

Settings for video recording, playback and vision processing.

Camera live view

Live View of the microscope camera, with optional motion tracking results.

Active motion tracking

Control of vision processing parameters to optimise the identification of particles of interest.

Software



Magnetic field control

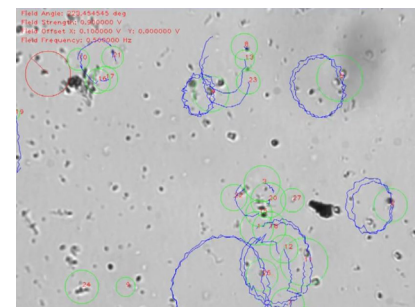
- ✓ Circular rotation of the field with variable frequency.
- ✓ Constant switching between North-South, East-West, or up-down.
- ✓ Manual control of the field through the included joystick or mouse.
- ✓ User-defined sequence of automatic field variation.



Image processing

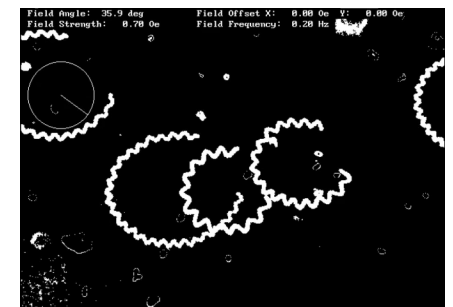
- ✓ Active tracking with optional export of trajectories
- ✓ Counting of moving objects
- ✓ Threshold view for passive tracking of moving objects.

Additional software functionality can be added upon request.



Active tracking example

Moving particles are recognised, counted, and their trajectories are plotted.



Passive tracking example

Threshold view and image stacking to visualise the motion of moving particles.

Technical specifications and available configurations

Bacteriodrome			
Model	Basic	Advanced	Custom
Optical system	Inverted microscope Olympus CKX53	Inverted microscope Olympus CKX53	Custom
Magnification	40x, 100x, 400x	40x, 100x, 400x	Custom
Magnetic field source	2-axis Helmholtz coils	2-axis Helmholtz coils	3-axis Helmholtz coils
Maximum applied field	1 mT	1 mT	1 – 3 mT
Non-magnetic stage	Static	Motorised	Motorised
Digital camera	Customisable	Customisable	Custom

Magnetodrome			
Model	Basic	Advanced	Custom
Optical system	Inverted microscope (Olympus CKX53)	Zoom lens (Keyence VH-Z500R)	Custom
Magnification	40x, 100x, 400x	100-1000x	Custom
Magnetic field source	2-axis electromagnets	2-axis electromagnets	Up to 3 axis electromagnets & HH coils
Maximum applied field	Up to 100 mT	Up to 100 mT	Up to 100 mT
Non-magnetic stage	Motorised	Motorised	Motorised
Digital camera	Customisable	Customisable	Custom

Application examples



Biomagnetism

Our Magneto- and Bacteriodromes have been originally developed to investigate and manipulate magnetotactic bacteria. These microbes are common in aquatic environments worldwide and important for the magnetisation of natural sediments. Internal permanent magnets cause a passive alignment of the microbes in magnetic fields, resulting in directed locomotion.

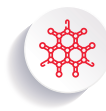


Microrobotics

In the emerging field of magnetic microrobotics, precisely controlled magnetic fields are used for the locomotion of tiny robots through wireless power transfer or by direct motion control via magnetic force or torque. These techniques can be applied to small-scale transporting and mixing of chemicals, microfluidics, bioengineering or nanorheology. Medical applications include targeted drug delivery and minimally invasive surgery.

Bacteriodrome: Through rotating or oscillating homogeneous magnetic fields produced with triaxial Helmholtz coils, magnetic micro-propellers or microbeads, can be precisely navigated, mimicking the motion of microorganisms in fluids.

Magnetodrome: Direct propulsion of magnetic microrobots can be achieved by magnetic field gradients produced with an arrangement of electromagnets.



Material Sciences

Controlled magnetic fields are used in colloidal science for the self-assembly and aggregation of para- or ferromagnetic nanoparticles into ordered structures. The technology is used to develop and fabricate novel functional materials, with extensive applications in the chemical industry, biotechnology, pharmaceuticals, and nanotechnology.

MAG

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