DM100 series
Instruments for Magnetic nanoHeating

The next step on Magnetic nanoHeating research

2015 Catalog
DM100 series Instruments for Magnetic nanoHeating

nB nanoScale Biomagnetics introduces the DM100 Series, the only integral, immediate and reliable solution for laboratory tests on Magnetic HyperThermia and Induction nanoHeating.

One sole equipment to apply, measure and analyze the results. One model for every application. The DM100 Series gives the answer to all your needs in MHT/InH instrumentation either with its series models or custom made applications. DM100 Series is also the only integral, immediate and reliable solution to the instrumentation needs of MHT through all its stages: from magnetic characterization to clinical application.

The design conceptualization of the DM100 series emerges from the real need of the Magnetic Hyperthermia lab of the Institute of Nanosciences of Aragón (Spain). The specific needs involved in the process of applying a magnetic field, measuring and analyzing the results were thoroughly examined and approached one by one, leading to an integrated and final solution that guarantees the highest standards in Magnetic Hyperthermia research. The results achieved with DM100 Series are now endorsed by published results on characterization of nanostructured materials, experiments with cell culture, parasitology, among other fields.

Come and take a close look to DM100 devices and accessories and find the best setup for you.

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DMC1 System controller

Electronic specifications
- Input voltage: 100-240 V AC, 50-60 Hz
- Maximum input power: 2600 W
- Maximum input current: 16 A

Mechanical specifications
- Dimensions: 505 x 489 x 230 mm3
- Weight: 24 kg

Environmental and safety specifications
- See DM4

System requirements
- Electrical supply:
  - 100-240 VAC – 50-60 Hz, 2600W

Software features
MANIAC v2.0 is the software environment which allows the user to run and schedule induction heating tests for research in magnetic hyperthermia in DM100 devices, as well as monitoring and analyzing the results of such tests.

Main functions:
- Test: induction heating test implementation on DM100 series equipments
- Experiments: tests automation on DM100 series equipments
- Selection of magnetic field or temperature as control variable in tests and experiments
- Definition of set point as constant or in function of time in experiments
- Real-time monitoring of equipment sensors.
- Equipment sensors readings log.

The Zar v1.0 application of the software MANIAC analyzes the heating curves of a magnetic colloid type sample which are obtained when carrying out an induction heating test with a DM100 series device.

Main features
Local User Interface
- 15” tactile color monitor
Optional mouse and keyboard
- Two lines LCD status display
Software
Control and automation software for embedded system
- Data Analysis software for embedded system
- SAR and ILP calculation
- Experiment sequence programming
 Connectivity
- USB Storage port
- Serial port

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nB nanoScale Biomagnetics

DM100 Series System Controller

DMC1 is the brain and the power of all DM100 Series sets.

nB’s unique embedded software, MANIAC, helps you program and controls your experiments, records the measured data, and processes your experimental results into truly useful and ready to publish reports and graphic presentations.

A reliable, powerful, fully automated and easy way of moving forward on your magnetic hyperthermia research plans.
DM1 Series Applicator for calorimetry

DM100 Series Applicator

Magnetic hyperthermia tests
SAR measurement
Magnetic colloid characterization
Magnetic nanoparticle heating

Precision and reproducibility in magnetic colloid characterization.

DM1 is the only device on the market specially designed for an accurate determination of the physical parameters that describe the heating effects of alternating magnetic fields on magnetic nanosystems.

A reliable, powerful, fully automated and easy way of moving forward on your magnetic hyperthermia research plans

Main features

RF Section
Up to 8 user selectable frequencies from 10KHz to 800KHz
Up to 350 Oe (27825 A/m) field.
Water cooling connection (chiller not included)

Sample Section
Open Dewar flask with vacuum socket
2ml disposable vial sample holder
Sensors
Optic fiber temperature probe
Water pressure sensor

Control method
B field user selectable curve
Sample temperature user selectable curve
Combined B-T user selectable curve

Field distribution on the sample volume

Typical values. Each device is individually calibrated and documented.

Electrical specifications
- Operating connection I:
  - Voltage range: 0–110 V DC
  - Maximum power: 1000 W
  - Maximum current: 20 A
- Operating connection II:
  - Voltage: 220 V, 50 Hz
  - Maximum power: 300 W
  - Maximum current: 5 A

Mechanical specifications
- Dimensions: 435 x 212 x 285 mm³
- Weight: 29 kg

Environmental and safety specifications
- Temperature ranges:
  - Normal operation: 5–40 °C
  - At maximum power: 5–30 °C
  - Storage: -20–70°C
- Humidity: 20–80%
- Electromagnetic Compatibility: EMC

Mechanical specifications
- Field distribution on the sample volume

Sample holder column
Protected tip
High resolution fiber optic signal conditioner
FOT-L-NS-705 fiber optic temperature contact sensor with protected tip

Standard operation modes
A maximum of 8 modes can be activated on a single device.

The tables cannot be merged into one single device.

Intensity magnitudes provided in peak Gauss value. For peak to peak value, multiply by 2.

A maximum of 8 modes can be activated on a single device.

Custom made frequency and higher intensity modes on demand

Frequency and field corrections < 3%

Low frequency DM1 series applicators

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<th>f (kHz)</th>
<th>Bmin (G)</th>
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Frequency and field corrections < 2%

High frequency DM1 series applicators

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<th>f (kHz)</th>
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Frequency and field corrections < 2%, field correction < 3%
**Main features**

**RF Section**
- Up to 4 user selectable frequencies from 100 KHz to 500 KHz
- Up to 200 Gauss (15.9 kA/m) field.
- Water cooling connection (chiller not included)

**Sample Section**
- Multiple optional sample holders
  - 60 mm/80 mm diameter versatile sample chamber in vitro, in vivo and calorimetry accessories.
- Sensors
  - 1 or 3 fiber optic temperature sensor
  - Water pressure sensor

**Control method**
- B field user selectable curve
- Sample temperature user selectable curve
- Combined B-T user selectable curve

**Combined experiments**

**DM2 applicator**

**Electrical specifications**
- Operating connection I:
  - Voltage range: 0-360 V DC
  - Maximum power: 1500 W
  - Maximum current: 15 A
- Operating connection II:
  - Voltage: 220 V, 50 Hz
  - Maximum power: 230 W
  - Maximum current: 2.5 A

**Mechanical specifications**
- Dimensions: 435 mm x 372 mm x 259 mm
- Weight: 29 kg

**Environmental and safety specifications**
- Temperature ranges:
  - Normal operation: 5-40°C
  - At maximum power: 5-30°C
  - Storage: -20 to 70°C
- Humidity: 20-80%

**EMC and safety**
- UNE-EN 61010-1:2011
- Typical input pressure: 2.9 bar
- Two flexible tubes of 30 mm internal diameter to connect to the provided series 24 hydraulic connectors.

**Standard connectors**
- Two 24 series hydraulic connectors for the cooling system
- Temperature measuring system:
  - Dual or quad channel high resolution fiber optic signal conditioner
  - 1 or 3 fiber optic temperature sensor

**Field distribution on the sample volume**
- Typical values. Each device is individually calibrated and documented.

**Combination accessories**
- Custom designed sample holders, probes and accessories.

**Compatible accessories**
- CAT: Controlled atmosphere accessory for in vitro tests
- CAL: Vacuum dewar flask calorimeter with sensor probe
- DRM: Drug release monitor system for in vitro tests
- HBM: Heartbeat monitor system for small animals
- IR1: Infrared thermal image system
- Custom designed sample holders, probes and accessories.

**Technical specifications**
- Frequency correction < 2% for the cooling system
- Field correction < 4%

**System requirements**
- Electrical supply: connect the applicator-controller connecting
  - Minimum cooling power: 1600 W
  - Typical flow: 5.7 l/min
  - Typical input pressure: 2.9 bar

**Magnetic hyperthermia in vitro tests**
- Magnetic colloid characterization
- Combined experiments
- Custom designed accessories

**Compatible accessories**
- DM1: Drug release monitor for in vitro tests
- CAT: Controlled atmosphere and temperature accessory for in vitro tests
- CAL: Vacuum dewar flask calorimeter with sensor probe
- HBM: Heartbeat monitor for small animals
- IR1: Infrared thermal image system
- Custom designed sample holders, probes and accessories.

**Standard operation modes**
- Low frequency DM2 applicators
  - CAT: Controlled atmosphere accessory for in vitro tests
  - CAL: Vacuum dewar flask calorimeter with sensor probe
  - HBM: Heartbeat monitor system for small animals
  - IR1: Infrared thermal image system
  - Custom designed sample holders, probes and accessories.

**High frequency DM2 applicators**
- Frequency correction < 2%
- Field correction < 4%

**System requirements**
- Electrical supply: connect the applicator-controller connecting
  - Minimum cooling power: 1600 W
  - Typical flow: 5.7 l/min
  - Typical input pressure: 2.9 bar

**DM2 series**
- Magnetic nanoHeating Instruments for
- www.nbnanoscale.com

**DM100 Series**
- DM100 Series Applicator
- for in vitro tests and multiple uses

**Sensor with protected of unprotected tip**

**Technical specifications:**
- Measuring range: 10°C to 120°C
- Precision: ±0.2°C
- Probe-holder sample set:
  - Temperature sensor
  - Sample holder
**DM3**

**DM100 Series Applicator for in vivo hyperthermia tests**

**Main features**
- **RF Section**
  - 4 user selectable frequencies from 80KHz to 450KHz
  - Up to 450/300 Gauss/Oersted (35.7/27.8 kA/m) field.
  - Water cooling connection (chiller not included)
- **Sample Section**
  - Animal bed for mice or rats
  - Surface and whole body application versions
- **Sensors**
  - 1 or 3 local temperature sensor
  - Water pressure sensor
- **Control method**
  - B field user selectable curve
  - Local temperature user selectable control option
  - Combined B-T user selectable curve
  - Infrared imaging control loop
- **Compatible accessories**
  - HBM: Heartbeat monitor system for small animals
  - IRs: Infrared thermal image system
  - DRM: Drug release monitor system for in vitro tests
  - Micro CAT: Controlled atmosphere for tests in small petri plates
- Custom designed sample holders, probes and accessories.

**DM3**

**Magnetic hyperthermia in vivo tests**

**Local and systemic temperature sensing**

**Local or whole body versions**

**Heartbeat monitoring**

**Thermal imaging**

Maximum precision and ergonomy for in vivo developing and testing of magnetic hyperthermia and drug realease therapies

DM3 is the only device on the market specially designed for an accurate application of alternating magnetic field, local sensing and experiment monitoring in mice and rats on laboratory hyperthermia procedures

A reliable, powerful, fully automated and easy way of moving forward on your magnetic hyperthermia research plans

**DM3 applicator**

**Electrical specifications**
- See DM3

**Mechanical specifications**
- Dimensions: 435 mm x 212 mm x 259 mm
- Weight: 29 kg

**Environmental and safety specifications**
- See DM3

**System requirements**
- See DM3

**Standard accessories**
- Two 24 series hydraulic connectors for the cooling system
- Temperature measuring system:
  - Dual channel high resolution fiber optic signal conditioner

**Standard operation modes**

Frequencies and intensities on available devices may differ. Please, ask nB before ordering.

Exceptionally, values on final devices may present up to 10% factory tolerance in some high energy modes. Typical tolerance is ±2%.

Intensity magnitudes provided in peak Gauss value. For peak to peak value, multiply by 2.

A maximum of 8 modes can be activated on a single device

**Custom frequency modes on demand**

**DM3 - G**

**Whole Body applicator**

**DM3 - J**

**Surface applicator**

**DM3 - H**

**Whole Body open view applicator**

**www.nbnanoscale.com**

**New!**

**DM3**
Magnetic nanoHeating research

The next step on

and SAR measurement

Main features

Visible video monitoring
Image backfield field control loop
Image data analysis
Raw data available for external analysis
Optional local probe calibration
Useful for in vitro, ex vivo, materials and in vivo tests.

MAGNO

Magnetic colloid for Magnetic nanoHeating

MAGNO is the first commercially available magnetic colloid specially designed for Inductive nanoHeating applications.

Optimizing the heating properties of MNPs is cumbersome and takes long time and dedicated manpower. MAGNO offers the solution for those researchers who need accurate data, repeatability and reliability to test new ideas such as physical models, or any heating applications.

MAGNO is a water-based magnetic colloid consisting of magnetite (Fe3O4) nanoparticles with average sizes of 25nm functionalized with a biocompatible polymer. The magnetic nanoparticles display an impressive SPA value (typically >210W/g, for f = 580KHz, H0 =23.877 KA/m).

MAGNO has been manufactured and synthesized under controlled conditions using the DM100 technology. The precise control of the manufacturing conditions gives MAGNO a highly reproducible heating behavior and SPA values under different conditions, and an outstanding stability over the time.

MAGNO is the ideal raw material for a first approximation to inductive nano heating research as well as for a great variety of advanced applications, only limited by your imagination. Covered by Polyethylenimine (PEI), MAGNO nanoparticles constitutes a powerful tool not only for basic research on power absorption but also for different applications in most fields of biomedicine.

MAGNO has been developed by nB nanoScale Biomagnetics under three basic principles for inductive heating research: repeatability, traceability and reliability.

www.nbnanoscale.com
DM100 Series is a set of instruments, accessories and software tools that can be combined to form different configurations covering every kind of Magnetic Hyperthermia and Induction nanoHeating experimental setup. Each DM100 configuration is a complete workstation that allows you to automatically run complex tests, register data and analyze your results.

DM100 Series is designed under a concept of modularity. One controller can be used to drive multiple applicators - not simultaneously. Here is a quick guide to how your DM100 system must to be configured.

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**Basic Setup**

**Accessories**

**Mandatory third party gear**

Water chiller

**Recommended third party gear**

Rotary or turbomolecular vacuum pump (recommended for calorimetry)

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