Vibration Control Technology

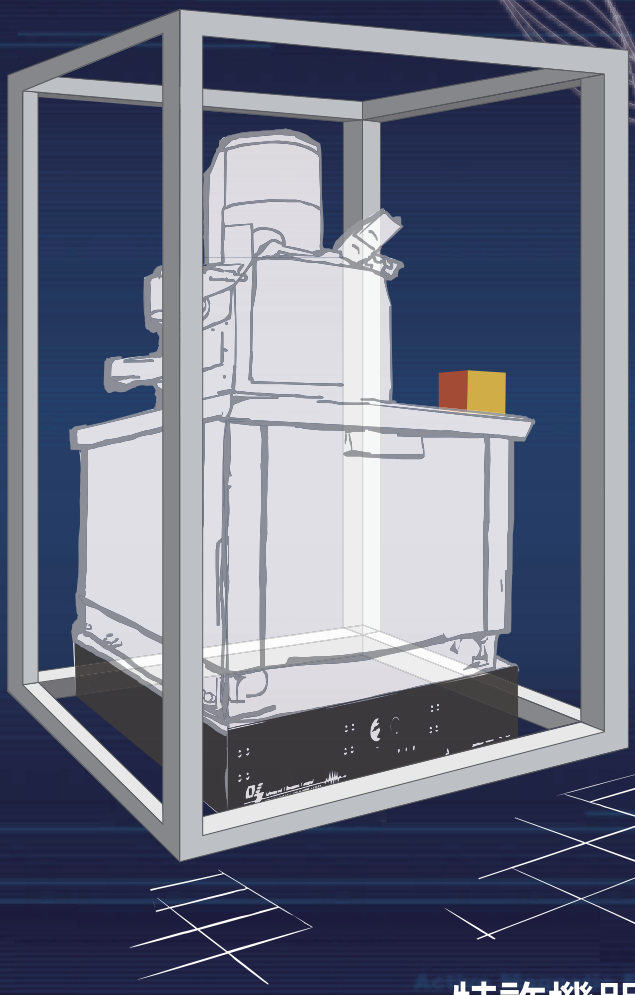
TOKKYOKIKI

【PAT.】

Active Magnetic Field Canceller

# AMC-331

## Protects Electron Beam application equipment from environmental magnetic interferences
## High performance Active Magnetic Field Canceller **AMC-331**



- Scanning Electron Microscope (SEM)
- Transmission Electron Microscope (TEM)
- Focused Ion Beam (FIB)
- Wafer Inspection System (CD-SEM)
- Electron Beam Lithography (EBL)
- Mass Spectrometer (MS)
- Others , EB application equipment

Amplifier & Controller
(DM-70)

特許機器株式会社

# The high performance active magnetic field canceller **AMC-331**

Magnetic field fluctuations due to indoor wiring, cars, trains and elevators adversely affect the electron beam as a disturbance of magnetic field, which is an obstacle to using these devices. The tool that solves this problem is the active magnetic field canceller system. The active magnetic field canceller system "AMC-331" is composed of active magnetic field canceller "DM-70", with the magnetic field sensor and the control coil. It helps to suppress the adverse effect of the magnetic field disturbance and improve the image of the electron microscope and the processing accuracy of the electron beam machining apparatus.

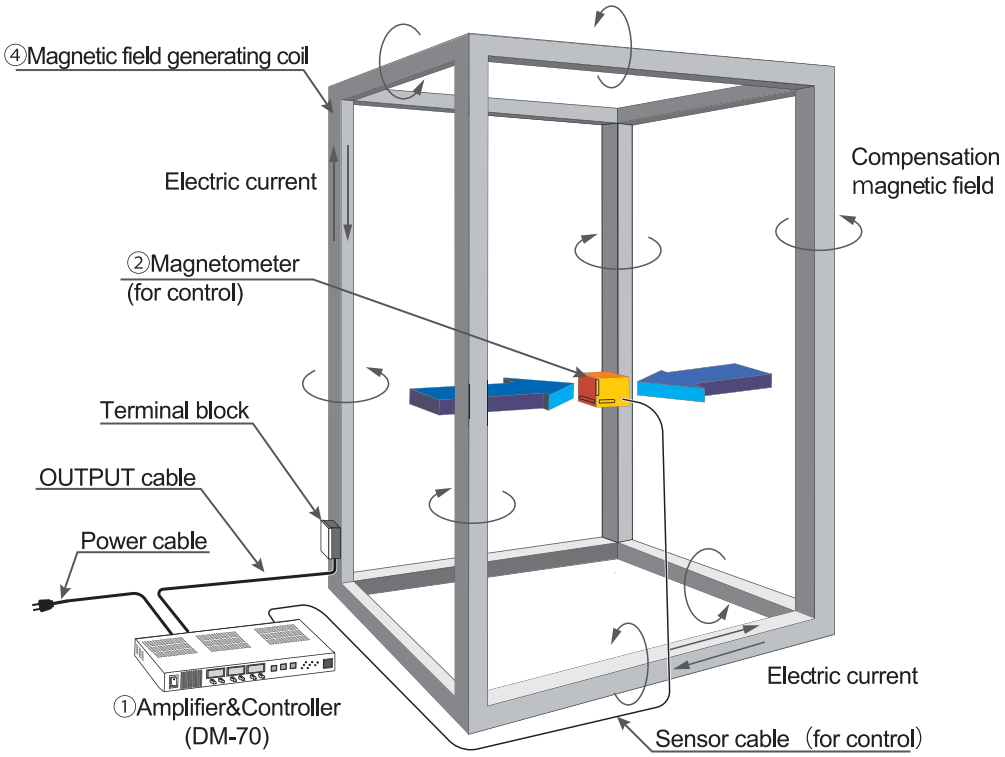
## Basic Theory(Helmholtz coil)

### ■ Causes of Magnetic Field Fluctuations

- Movement of magnetic bodies (automobiles,elevators ,trains,etc.)
- Electric power supply noise (50 or 60Hz)
- Peripheral equipment

### ■ Helmholtz Coil

Helmholtz coils are a pair of parallel coils of the same number of turns connected in series.
They will generate the magnetic field along the axis through the center of the two coils when the electric current flows in the coils.




To generate compensation magnetic field to cancel the magnetic disturbance.

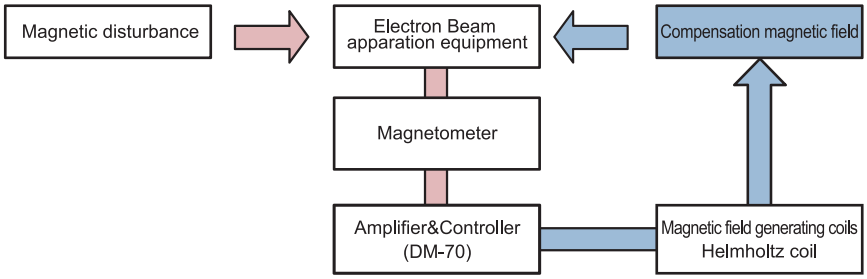
## System configuration

### ■ Configuration

① Amplifier & Controller
② Magnetometer
③ Control Software
④ Magnetic field generating coil

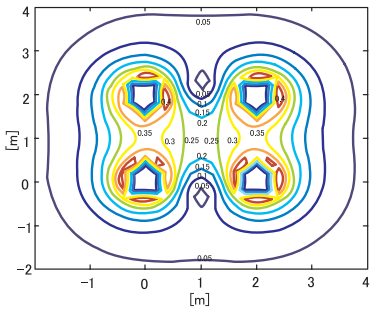
※PC for monitor is not included in the product.
※The cage (coil cover) varies according to the object and the demand of customers. It is optional, and should be ordered separately corresponding to the application.

## ■System block diagram

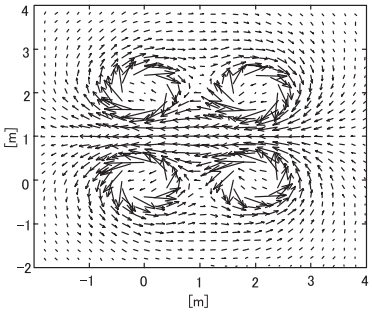



## ■Magnetic field measurement data

**Contour map of magnetic flux density**




**Parallel magnetic field from Helmholtz coil**



## Features

- **High Performance**
  - **High damping performance of maximum 40～60dB**
- **Low Cost**
  - **Cost of 1/10 against passive shield solution**
- **Easy Installation**
  - **Easy installation just for arrangement of coils around the equipment to be protected**
- **Optimum Design**
  - **Coil design in accordance with the target tool.**
- **Digital Control**
  - **Pin-point control of several magnetic field disturbances based upon the frequency analysis.**

Control Procedure
Quasi DC + Typical AC component control + Independent feedback control for each axis

Control Range
±15μT

Control Frequency Range
DC～1kHz

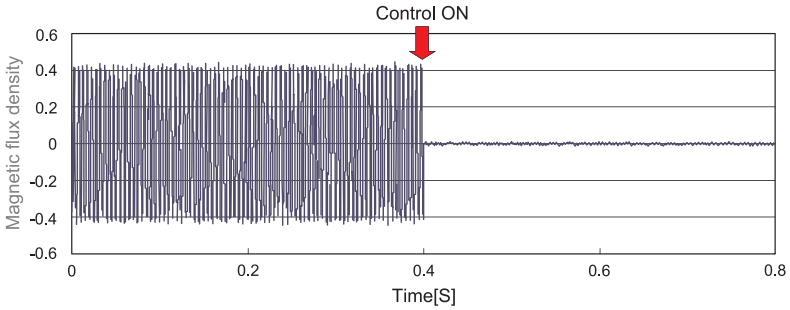
Maximum Reduction Ratio
40～60dB

## Application

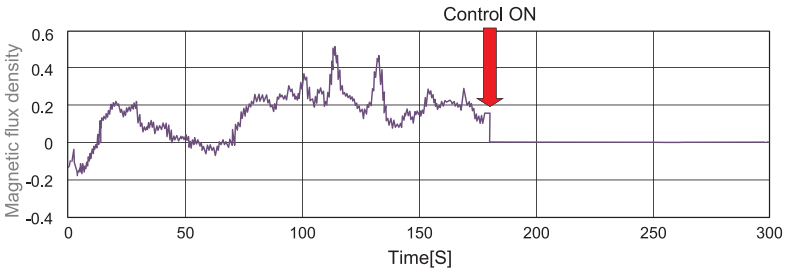
- **Scanning Electron Microscope (SEM)**
- **Transmission Electron Microscope (TEM)**
- **Focused Ion Beam(FIB)**
- **Wafer Inspection System (CD-SEM)**
- **Electron Beam Lithography (EBL)**
- **Mass Spectrometer(MS)**

## Experimental results

**1) Experimental results at 200Hz disturbance**




**2) Experimental results with environmental disturbance**




## SEM image improvement by AMC-331 OFF / ON

**Image: AMC OFF**

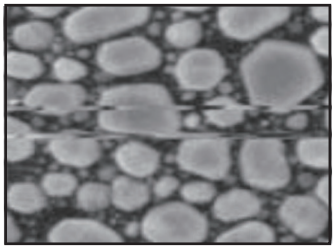


**Image: AMC ON**

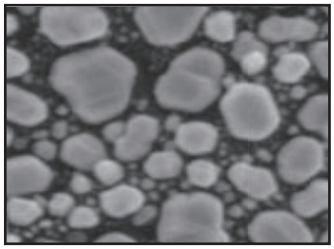


**Image: AMC OFF**

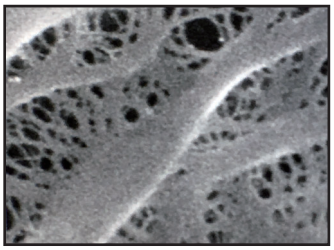
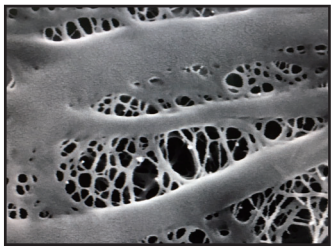
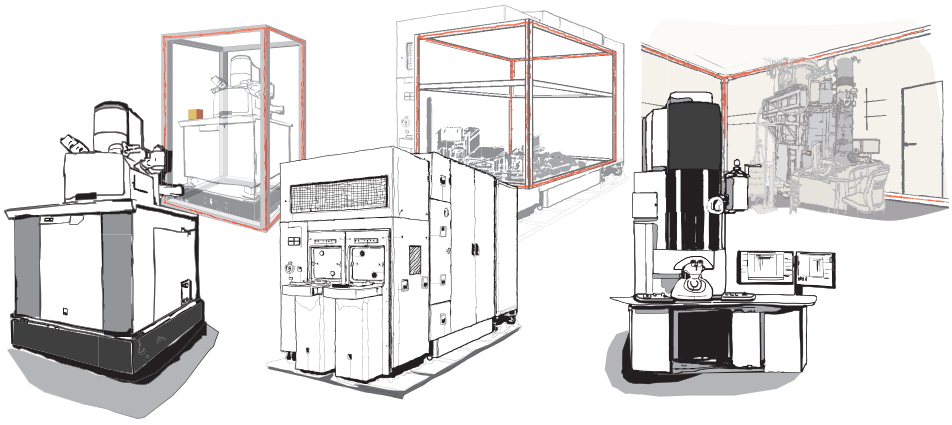


**Image: AMC ON**



## Coil Cable Installation Option



**Cage type** **Inside tool** **On the room wall**

In addition, we can provide installation proposals and dual sensor solution according to specifications and requirements.In summary, AMC-331 protects the equipment from electro magnetic interferences.

# AMC-331 Specifications

| Description of Whole System | |
|---|---|
| Model | AMC-331 |
| Main Configuration | Controller |
| | Magnetometer |
| | Control Software |
| | Magnetic field generating coil |
| Control Method | Three axes (X,Y,Z) Simultaneous Control |
| | Quasi DC+Typical AC component control |
| | Independent Feedback Control for each axis |
| Control Range | ±15μT(at 2 x 2 x 2m) |
| Control Frequency Range | Quasi DC 1kHz |
| Attenuation Factor | Maximum 40~60dB |

| Controller | |
|---|---|
| Model | Digital Controller DM-70 |
| Main Configuration | Control / Procsessor(CPU-DSP)Board,Sampling(AD-DA)Board |
| Sampling Frequency | 2kHz |
| A/D and D/A resolution | A/D 18bit, D/A 16bit |
| Input Channel | 3ch / 3 axis of Fluxgate Sensor (Dual Sensor for Option) |
| Output Channel | 3ch / 3 axis of output coils, BNC for monitoring (3ch / 3 axis, Dual Sensor for Option) |
| Display | Digital display for X/Y/Z EMI value<br>(At sensor point, AC/DC switchable, μTp-p) |
| AC Power | AC100-240V 50/60Hz 300W |
| Dimention | 430(W) x 460(D) x 44.5(H)mm(Except protruding parts) |
| Weight | 4.5kg |

| Magnetometer | |
|---|---|
| Sensor Type | Fluxgate |
| Frequency Range | DC～1kHz |
| Measurement range | ±100μT(1G) |

| Control Software | |
|---|---|
| Model | AMC Mon 1.2 |
| Main Function | Real-time Wave Monitor(Time Series of FFT) |
| | Control Parameters Adjusting |
| | Wave Data Recording to a Log File |

| Coils for Generation Magnetic Field | |
|---|---|
| Coil Structure | 3 Axes Helmholtz-Coil Cage |
| Output Coil Current | ±2A/ch Max |

**The caution for safety** Please read the Instruction Manuals carefully before use.

This catalogue is for the product as of Oct.2020. The specification may be modified without notice.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