

MRT/300 - 300mm Magnetic Annealing Tool

STT-RAM Development and Production

The MRT/300 is a high field magnetic annealing tool for 300mm size wafers, that provides unrivalled throughput in a robust production platform. The tool is supplied in two configurations with magnetic fields up to 5 Tesla (MRT5000/300) and up to 2 Tesla (MRT2000/300) and with batch sizes of up to 100 x 300mm wafers. Higher magnetic fields are available subject to the customers process requirements.

The tool incorporates Magnetic Solutions patented high throughput oven technology for large wafer batches. With an operating temperature up to 600 °C, the oven provides high accuracy thermal control to within 1 °C in a clean processing environment. Differential cooling of two chambers within the oven achieves fast thermal cool-down under high vacuum or inert gas conditions, providing shorter processing times and increased throughput. The medium loss design of the oven provides fast response at all stages of the thermal process with flexibility to accurately control ramp rates, overshoot, settling times, set-point accuracy and thermal uniformity at soak.

A closed cycle superconducting magnet provides a fully variable field up to 5 Tesla. The magnet coil is cooled by twin cryogenic compressors that retain a reservoir of liquid He in the cryostat. This provides excellent thermal stability for the magnet coil and reliable long term operation of the tool. This design also allows the magnet to carry out back-to-back runs without any dwell time in between, further enhancing throughput in production.

Tool Layout

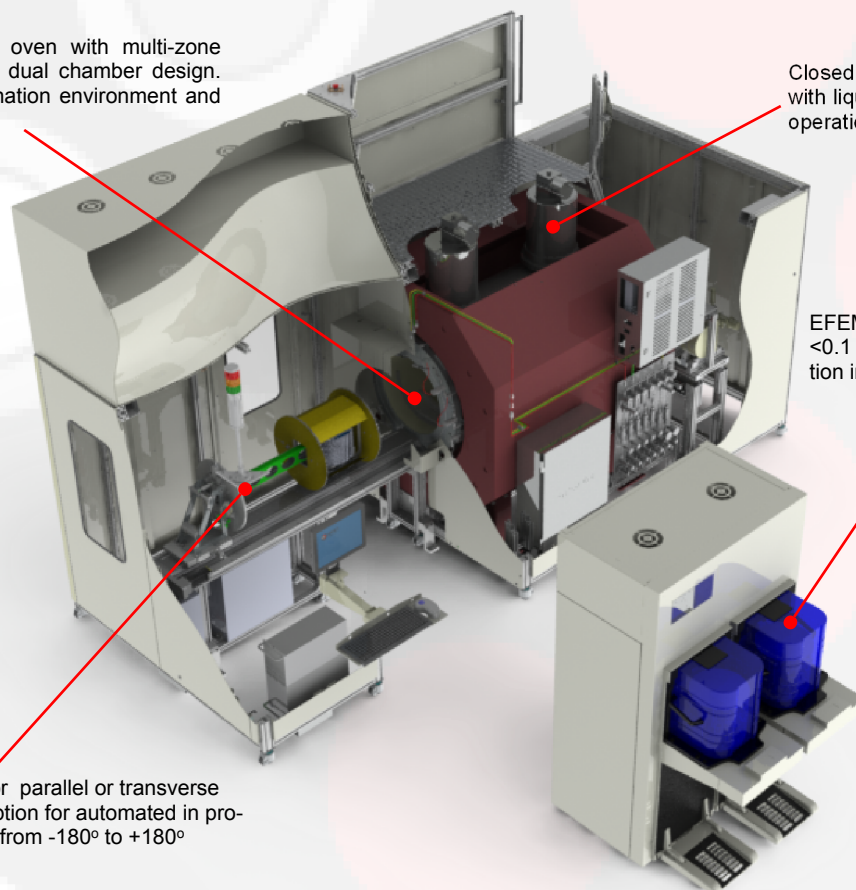
Enclosure cut away for clarity of presentation

Quartz lined vacuum oven with multi-zone heating elements and dual chamber design. Provides low contamination environment and high wafer throughput

Closed cycle superconducting magnet with liquid He reservoir for high stability operation in production use

EFEM with wafer pre-alignment to <0.1 degrees, with range of production interface options

Wafer transfer stage for parallel or transverse anneal orientations. Option for automated in-process wafer positioning from -180° to +180°



Wafers can be annealed with their orientation either parallel or transverse to the magnetic field direction. Wafer orientation is a selectable parameter in the tools recipe management software and no hardware modifications are required when changing from one orientation to the other.

MRT/300 tools can be supplied in a bridge tool configuration allowing processing of 200mm and 300mm wafers. A range of options are provided that allow the customer to match their process needs and budget with the tool configuration.

Specification Summary

Batch configuration options: 100 x 200/300mm Si
50 x 200/300mm Si
25 x 200/300mm Si

Wafer orientation: In plane or transverse to the magnetic field direction
Option for in process wafer positioning -180° to +180°

Magnetic field range: Up to 5.0 Tesla variable - MRT5000/300
Up to 2.0 Tesla variable - MRT2000/300
Option for higher magnetic fields if required

Magnet type: Closed loop superconducting magnet
Magnetic homogeneity: +/- 3 %
Magnetic uniformity: +/- 1 degree
Magnetic set-point accuracy: < 5 mTesla
Stray field: < 0.5 mTesla at 1 m from tool
Magnetic shield: Passive or active shielding
Magnet thermal stability: Cryostat temperature <5 K for up to 8 hours after power outage

Thermal range: 150 – 600 °C
Ramp rate: Up to 8 °C/min
Set-point accuracy: 1 °C
Thermal uniformity: +/- 2 °C

Vacuum range: 2 torr to <5E-7 torr
Gas: Up to 4 process gasses

FM contamination: <0.06 adders/cm² @ >= 0.09 micron per pass
Metal & Ionic contamination: <2E10 atoms/cm²
Tool pressure monitor: Per I300I
Options for;
Airborne particle monitor
Gas line filters and Oxygen scrubbers
RGA fitted to process chamber

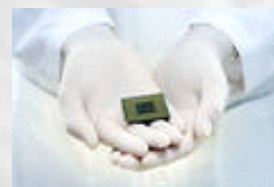
Wafer loading:: Automated via EFEM
Load-port capacity: 2 x 25 wafer FOUP
Wafer alignment: <0.1 degrees by automated prealigner
Option for:
Wafer bar code reader, OCR reader, OHT

Certifications: SEMI S2 /S8, CE, Seismic zone 4

Connectivity: SECS/GEM capable, SEMI 0306, Interface A

Installation configuration: Bay/Chase to ISO Class 2

Performance metrics:
> MTBF > 1,500 hrs
> MWBF > 5,000
> Uptime > 97%



Installation Worldwide by Magnetic Solutions Ltd

Warranty 2 year warranty provided

Patents
US 7,479,621
Other patents pending



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