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Hitachi High-Tech Launches the GT2000, High-Precision Electron Beam Metrology System to Meet the Needs of Semiconductor Devices Development and Mass Production in the High-NA EUV Generation

GT2000 High-Precision Electron Beam Metrology System

Tokyo, December 12, 2023 – Hitachi High-Tech Corporation ("Hitachi High-Tech") announced today the launch of its GT2000 high-precision electron beam metrology system. GT2000 uses Hitachi High-Tech's technology and expertise in CD-SEM[*1], where it holds the top market share. GT2000 is equipped with new detection systems to cutting-edge 3D semiconductor devices. It also utilizes low-damage high-speed multi-point measurement functions for High-NA EUV[*2] resist wafers imaging to minimize resist damage and improve yield in mass production.
Hitachi High-Tech GT2000 CD-SEM will enable high-precision, high-speed measurements, and inspection in the manufacturing process of advanced semiconductor devices, which are becoming increasingly miniaturized and complex, and contribute to the improvement of customer yields in research-and-development and mass production.

*1 CD-SEM (Critical Dimension-Scanning Electron Microscope): An equipment designed to perform high-precision measurement of the dimensions of fine semiconductor circuit patterns formed on wafers.
*2 High-NA (Numerical Aperture) EUV (Extreme Ultraviolet): Extreme ultraviolet (13.5 nm wavelength) lithography equipment with an improved numerical aperture compared to conventional equipment.

Development Background

As semiconductor device manufacturing processes evolve, research-and-development of N2 (2-nanometer generation node) and A14 (14-angstrom generation node) is underway. In addition to the application of High-NA EUV lithography in state-of-the-art devices, the complexity of device structures is expected to increase, such as the GAA[*3] and CFET[*4] structures.
Hence, the need for high-speed data acquisition under a wide range of measurement conditions to measure various materials and structures, stable operation and further tool-to-tool matching improvements in the research stages and mass production for cutting-edge semiconductor devices process development is increasing.

*3 GAA (Gate All Around): A transistor structure in which the gate completely covers the channel
*4 CFET (Complementary Field Effect Transistor): A complementary field effect transistor in which n-type and p-type devices are stacked

Key Technologies

1. 100V ultra-low acceleration voltage and ultra-high-speed multi-point measurement functionality for High-NA EUV processes

In the High-NA EUV lithography process, the resists used are thinner and, therefore, in order to measure it with high precision, metrology tool must cause as little damage as possible to the resist. GT2000 achieves low damage and high-precision measurement by combining pioneering ultra-low acceleration voltage of 100V, with our proprietary high-speed scanning functionality. In addition, it is equipped with an ultra-high-speed multi-point measurement mode to quickly determine manufacturing process conditions and detect abnormalities in research and development stage.

2. High-sensitivity detection system for 3D device structures

3D devices with structures such as GAA, CFET, and 3D memory require measurements of patterns' depth, hole' and trenches' bottoms in addition to conventional CD measurement. GT2000 is equipped with a new highly sensitive detection system that efficiently detects backs-scattered electrons, enabling high-precision imaging of increasingly complex device structures and expanding the possibilities of new measurement applications.

3. New platforms and new electronic optical systems to improve tool-to-tool matching

One of the most important performance requirements for CD-SEM, which is responsible for process monitoring, is that the difference in measurement values between multiple tools is small. GT2000 new platform and electronic optical systems have been redesigned to eliminate any factors that cause differences in measurement values, thus, improving tool-to-tool matching.

By offering GT2000, as well as our metrology systems using electron beam technology and our optical wafer inspection systems, Hitachi High-Tech is working to meet customers' various needs in processing, measurement, and inspection throughout the semiconductor manufacturing process. We will continue to provide innovative and digitally enhanced solutions to our products for the upcoming technology challenges, and create new value together with our customers, as well as contributing to cutting-edge manufacturing.

Website for GT2000

https://www.hitachi-hightech.com/global/en/products/semiconductor-manufacturing/cd-sem/metrology-solution/semi-gt2000.html

Introduction Video for GT2000

https://bcove.video/3TltYkI

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About Hitachi High-Tech Corporation

Hitachi High-Tech Corporation, headquartered in Tokyo, Japan, is engaged in activities in a broad range of fields, including manufacture and sales of clinical analyzers, biotechnology products, and analytical instruments, semiconductor manufacturing equipment and analysis equipment. and providing high value-added solutions in fields of social & industrial infrastructures and mobility, etc.

The company's consolidated revenues for FY 2022 were approx. JPY 674.2 billion. For further information, visit https://www.hitachi-hightech.com/global/en/

Contact:
Takumichi Sutani
Business Planning Dept., Metrology Systems Div.,
Nano-Technology Solution Business Group, Hitachi High-Tech Corporation
Contact Us : Hitachi High-Tech Corporation (hitachi-hightech.com)

Information contained in this news release is current as of the date of the press announcement, but may be subject to change without prior notice.