

Healthcare

1 cobas pure integrated solutions: Automatic Biochemistry and Immunology Analyzer

Clinical testing using automatic analyzers analyze the components contained in biological fluids, mainly blood, and the results are used for diagnosis, selection of therapeutic agents, and confirmation of therapeutic effects. Hitachi High-Tech Corporation led the world in bringing integrated automatic analyzers for clinical chemistry and immunochemistry, and remains a market leader in the field. The cobas[®] pure integrated solutions, an integrated automatic analyzer for clinical chemistry, immunochemistry, and ion selective electrode (ISE) testing, is characterized by the compact integration of analytical technologies developed to date, enabling rapid measurement. The control unit located in the center of the system enables sample transportation in a short time for emergency testing, and each device has been downsized to achieve a footprint of just 2 m². Also, the operation method, reagents, and consumables of the system are compatible with upper-level models, which makes it even

simpler and more efficient for laboratory technicians in their routine work.

The cobas pure integrated solutions, which simplify the operation process in clinical testing, contribute to efficient operation and rapid testing in laboratories. (Hitachi High-Tech Corporation)

* See "Trademarks" on page 150.

2 Simultaneous Launch of Collaboration and In-house Business for Compact Capillary DNA Sequencers

Capillary electrophoresis (CE) deoxyribonucleic acid (DNA) sequencers are the instruments used for DNA sequencing (the determination of the base-pair sequence of a DNA fragment) and DNA fragment analysis (sizing, relative quantitation, and genotyping information using fluorescently labeled DNA fragments), the blueprint of life. Thereby they are widely used in the medical and health fields, for human identification in criminal



1 Integrated automatic analyzer for clinical chemistry and immunoassay (top), e402 immunoassay analyzer (bottom left), c303 clinical chemistry/ISE analyzer (bottom right)



2 Compact CE Sequencer DS3000

investigations and for other markets that take advantage of the characteristics of CE, remaining a sizable market.

Hitachi High-Tech has developed the Compact CE Sequencer DS3000, suitable for measuring small numbers of various sample types and is easy-to-use, for the personal use market, which is expected to show strong growth. This product was commercialized as a Hitachi-brand CE DNA sequencer for its domestic and Asian markets. In addition, in collaboration with Promega Corporation of the USA, Hitachi is developing the business into other overseas markets.

The main features of the DS3000 are as follows:

- (1) Supports a wide variety of small samples: The direct polymer filling mechanism and polymer cartridge design enable customers to quickly analyze small numbers of various sample types for DNA sequencing and fragment analysis and also eliminate the need for periodic maintenance of the polymer flow channel.
- (2) Space-saving design: The system includes a built-in panel PC for operating the system and analyzing the sequencing and fragment analysis results, and a laser diode is used as the light source to reduce the size of the optical system, resulting in usage of 60 % less installation space than conventional systems.
- (3) Remote monitoring: A remote monitoring system using a general-purpose web browser has been installed to allow monitoring of the instrument status and setting of analysis conditions from a remote location for greatly improving convenience. In particular, the DS3000 enables schedule management of instrument use in a multi-user environment without dedicated software, which is a remarkable feature.

Hitachi aims to integrate various information types such as the genome, medical, health, and environmental

data to expand them into the digital solution business. (Hitachi High-Tech Corporation)

3 UH4150 AD+ Spectrophotometer for Optical Components

In recent years, cameras and sensors using near-infrared light have begun to be used in a wide range of advanced industries, and their applications are expanding to include remote sensing technologies such as light detection and ranging (LiDAR) for autonomous driving, night vision cameras, and face, iris, and vein recognition technologies as security tools. With the development of these optical devices, there is a growing demand for high-precision measurement of the spectral characteristics such as the absorbance, transmittance, and reflectance of optical components such as lenses and filters.

The UH4150 AD+ (advanced spec plus) spectrophotometer for optical components features improved measurement performance of spectral characteristics in the near-infrared region from the previous UH4150. The band-pass filters used in the latest cameras and sensors are coated with a thin optical film with shading performance of 6 Abs (transmittance 0.0001 %) to 7 Abs (transmittance 0.00001 %) or less.

The UH4150 AD+ features improved detector and signal processing for low transmittance photometry that enables a photometric range of 7 Abs, which is 1/100th the transmittance in the near-infrared region compared to before. This allows high-accuracy measurements of weak transmittance even in the near-infrared region, which could not be measured in the past.

(Hitachi High-Tech Science Corporation)



3 UH4150 AD+ spectrophotometer



4 SU8600 ultra-high-resolution FE-SEM (left) and SU8700 multipurpose high-resolution FE-SEM (right)

4 SU8600/SU8700 Scanning Electron Microscope

Field emission scanning electron microscopes (FE-SEMs) are used in a wide range of fields such as electronics, life science, and materials science because of their high image resolution, the abundance of information to be acquired, and easy handling of specimens. On the other hand, with the expansion of their applications, there is a need to acquire large amounts of data in short periods of time and to reduce the operation load on the user.

The new SU8600 and SU8700 include support functions for shortening the optical alignment time and can be equipped with the new software option, EM Flow Creator, that enables automatic data acquisition as a labor-saving feature when acquiring large volumes of data.

The SU8600 includes a high-brightness cold-cathode field-emission electron gun, which is effective for low acceleration voltage observation, which has become an important focus of FE-SEMs in recent years, enabling high-resolution observation of materials that are easily damaged by electron beam irradiation.

Equipped with a Schottky electron gun that can obtain a large electrical current rate, the SU8700 enables a variety of techniques from low acceleration voltage observation to analysis requiring a high probe current for a wide range of materials.

These instruments are expected to reduce the user load in the workflow and facilitate data acquisition and analysis.

(Hitachi High-Tech Corporation)

5 Compact AFM Designed to Maximize Practical Operability from an Operator's Perspective

For Higher Total Throughput and Reliability

Scanning probe microscopes are used in a wide range of fields, such as for organic and polymeric materials and electronics, as an analytical tool that can simultaneously provide observation of the sample surface morphology and mapping of the physical properties at the nanometer level. In recent years, with the spread of these instruments, there have been calls not only for a simplified data acquisition process but also for compatibility of analysis with different observation methods such as electron microscopy.

The AFM100 Plus and AFM100 are Hitachi High-Tech's original solution to these issues and were developed for the industrial and research and development fields.

The main features are as follows:

(1) In addition to simplifying the once-complicated measurement process, the system includes a function that automatically sets the optimum measurement conditions for the surface morphology of the sample, thereby improving ease of operation, reliability, and total throughput.

(2) S \bar{A} EMic.* (AFM-SEM correlation microscopy) is an observation technique that facilitates a multidimensional approach to analysis by observing the same part of a sample to measure its mechanical properties, electrical properties, and component analysis while taking advantage of the characteristics of each instrument.

(Hitachi High-Tech Corporation)

* Scanning Atomic and Electron Microscopy. Collective term for the SEM-AFM correlation analysis recommended by Hitachi.



Perform cross-checks using SEM

Supplement the interpretation of AFM physical images
 (elemental analysis, secondary electron image, reflection electron image)



AFM: atomic force microscope EDX: energy dispersive X-ray spectroscopy

5 AFM100 Plus/AFM100 multi-functional probe microscope system that also supports SÆMic.

6 Hitachi's First Compact Proton Therapy System Will Soon Be Operational

The proton therapy system ordered by the Tokushukai Medical Group in 2018 is being installed at the Shonan Kamakura Advanced Medical Care Center, and is in the final adjustment stage for operation in 2022. Tokushukai Medical Group, which operates 350 medical facilities in Japan, built the center on a site adjacent to Shonan Kamakura General Hospital to provide advanced radiotherapy and other advanced medical care.

By optimizing the system configuration, the footprint of the new system has been reduced to about 70 % of Hitachi's conventional system, making it possible to

install the system on a limited site in an urban area while also reducing the cost and time required for installation. The system is also equipped with the most advanced technologies. These include spot scanning technology that enables proton beam irradiation based on the shape of cancer, a 360-degree rotating gantry equipped with cone-beam computed tomography (CT), and a real-time image gating system*, making it both compact and highly functional.

* A technology that accurately irradiates protons on a tumor whose position fluctuates due to respiration or other actions by detecting its position in real time. This system was jointly developed by Hokkaido University and Hitachi, Ltd. with a grant from the Funding Program for World-Leading Innovative R&D on Science and Technology (FIRST) of the Japan Society for the Promotion of Science.



6 Proton therapy system treatment room in the Shonan Kamakura Advanced Medical Care Center