

Central Instrumentation Facility

Key Instruments

- GENESYS 180 UV-Vis Spectrophotometer
- Spectrum two FTIR
- Multiskan FC Microplate Reader
- Leica ICC50 E Microscope

CENTRAL INSTRUMENTATION FACILITY

GENESYS 180 UV-Vis Spectrophotometer

The GENESYS™ 180 is a modern UV-visible spectrophotometer manufactured by Thermo Fisher Scientific and is made for standard laboratory measurements, such as kinetic studies, chemical analysis, and biomolecule quantification. Accurate absorbance and transmittance measurements across visible and ultraviolet wavelength regions are made possible by the instrument, supporting a variety of analytical and life sciences applications.



Key Specifications

Parameter	Specifications
Instrument Type	UV–Visible Spectrophotometer
Wavelength Range	190 – 1100 nm
Optical System	Double-beam optics
Light Sources	Deuterium lamp (UV) and Tungsten-halogen lamp (Visible)
Spectral Bandwidth	~1–2 nm
Wavelength Accuracy	±0.1 nm
Photometric Range	–4 to +4 Abs
Scan Speed	Up to 29,000 nm/min
Stray Light	≤0.0003 %T
Detector	Silicon photodiode
Measurement Modes	Absorbance, Transmittance, Concentration, Kinetics
Interface	Touchscreen display
Sample Holder	Cuvette-based measurement system
Instrument Type	UV–Visible Spectrophotometer

Signature Features

- **Wide Spectral Measurement Range:** The UV-Visible spectrophotometer provides a wide spectral measurement range, enabling the analysis of compounds absorbing in both ultraviolet and visible regions for comprehensive molecular characterization
- **Touchscreen-Based Operation:** The UV-Visible spectrophotometer features a touchscreen-based interface that allows real-time data monitoring, easy wavelength selection, and simplified method setup.
- **High Analytical Accuracy:** The double-beam optical configuration of the UV-Visible spectrophotometer enhances analytical accuracy by minimizing instrumental drift and improving measurement precision
- **Rapid Data Acquisition:** It facilitates rapid scanning and kinetic measurements that are appropriate for the monitoring of enzymes and reactions.
- **Robust Laboratory Design:** The compact and robust laboratory design of the UV-Visible spectrophotometer makes it well-suited for routine teaching purposes as well as advanced research applications

Research Applications

- **Nucleic Acid Quantification:** Nucleic acid quantification is one of the most important applications of a UV–Visible spectrophotometer in molecular biology laboratories. It enables rapid determination of DNA and RNA concentration and assessment of sample purity before downstream applications such as PCR, cloning, sequencing, or gene expression analysis.
- **Protein Estimation:** Protein estimation is a fundamental application of UV–Visible spectrophotometry in biochemistry and molecular biology laboratories. It is essential for enzyme assays, protein purification studies, electrophoresis, Western blotting, and structural analysis. Spectrophotometric methods allow both quantitative determination of protein concentration and evaluation of protein stability.
- **Enzyme Kinetics:** The UV-Visible spectrophotometer plays a central role in enzyme kinetics, enabling real-time monitoring of enzymatic reactions by measuring changes in absorbance over time. Since many substrates or products absorb light in the UV-visible range, spectrophotometry provides a rapid, accurate, and non-destructive method to determine enzyme activity and kinetic parameters.
- **Chemical and Pharmaceutical Analysis:** The UV–Visible spectrophotometer is one of the most widely used analytical instruments in chemical and pharmaceutical laboratories. It plays a crucial role in quantitative analysis, drug development, formulation studies, and quality control processes. Its ability to measure absorbance in the ultraviolet (200–400 nm) and visible (400–800 nm) regions makes it suitable for analyzing a wide range of organic and inorganic compounds.
- **Environmental and Food Analysis:** The UV–Visible spectrophotometer is widely used in environmental monitoring and food quality analysis due to its accuracy, simplicity, and rapid

detection capability. It is particularly valuable for detecting pollutants, assessing nutrient levels, and ensuring food safety through colorimetric and direct absorbance methods.

- **Cancer and Biomedical Research:** The UV–Visible spectrophotometer plays a significant role in cancer and biomedical research by enabling quantitative and qualitative analysis of biomolecules, metabolites, and biological extracts. Its ability to measure absorbance in the 200 – 800 nm range makes it an essential tool for diagnostic research, drug development, and molecular studies.

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Spectrum two FTIR

The Spectrum Two™ Fourier Transform Infrared (FTIR) Spectrometer is an advanced analytical instrument used to identify chemical compounds and functional groups based on their absorption of infrared radiation. The system records infrared spectra that provide molecular fingerprints of organic, inorganic, and biological samples, making it an essential tool in biochemical, pharmaceutical, environmental, and material science research.



Key Specifications

Parameter	Specifications
Technique	Fourier Transform Infrared Spectroscopy (FTIR)
Spectral Range	4000 – 400 cm^{-1}
Resolution	Up to 0.5–1 cm^{-1}
Detector	DTGS detector
Beam Splitter	KBr beam splitter
Sampling Mode	ATR (Attenuated Total Reflectance)
Light Source	Infrared ceramic source
Scan Speed	Rapid spectral acquisition
Interface	Computer-controlled software system

Signature Features

- **ATR Sampling Technology:** The integrated Attenuated Total Reflectance (ATR) accessory enables direct analysis of solids, liquids, gels, and semi-solid samples without complex

preparation such as pellet formation. This simplifies workflow, reduces analysis time, and allows non-destructive testing of materials including polymers, pharmaceuticals, and biological samples.

- **High Sensitivity and Accuracy:** The Spectrum Two™ Fourier Transform Infrared (FTIR) Spectrometer precisely detects molecular vibrations corresponding to specific functional groups and chemical bonds. This allows accurate identification of compounds, structural characterization, impurity detection, and confirmation of material composition.
- **Rapid Spectral Acquisition:** The Spectrum Two™ Fourier Transform Infrared (FTIR) Spectrometer performs fast scanning with a superior signal-to-noise ratio compared to conventional dispersive IR systems. This ensures quick, reliable results and supports high-throughput laboratory environments.
- **Compact and Robust Design:** The compact benchtop structure of Spectrum Two™ Fourier Transform Infrared (FTIR) Spectrometer makes it suitable for routine laboratory applications in academic, industrial, and quality control settings. The durable design requires minimal maintenance while maintaining consistent analytical performance.
- **Automated Data Processing:** Advanced software enables automated spectral comparison, library matching, peak identification, and quantitative analysis. This supports material authentication, quality assurance, regulatory compliance, and research-based molecular investigations.

Research Applications

- **Biomolecular Characterization:** The Spectrum Two™ Fourier Transform Infrared (FTIR) Spectrometer enables identification of proteins, lipids, carbohydrates, and nucleic acids based on their characteristic functional group vibrations. It supports structural analysis of biomolecules by detecting specific absorption bands corresponding to amide, hydroxyl, and phosphate groups.
- **Pharmaceutical Analysis:** The Spectrum Two™ Fourier Transform Infrared (FTIR) Spectrometer is widely used for assessing drug composition, purity, and quality control by comparing spectral fingerprints. The system also detects polymorphic forms and excipients, ensuring formulation stability and regulatory compliance.
- **Environmental Monitoring:** The Spectrum Two™ Fourier Transform Infrared (FTIR) Spectrometer facilitates analysis of pollutants, organic contaminants, and hazardous compounds in air, soil, and water samples. It supports environmental quality assessment through rapid and non-destructive chemical profiling.
- **Polymer and Material Science:** The Spectrum Two™ Fourier Transform Infrared (FTIR) Spectrometer aids in polymer identification, functional group analysis, and monitoring degradation or aging processes. The instrument is also valuable in studying biomaterials and advanced materials for research and industrial applications.
- **Food and Nutritional Analysis:** The Spectrum Two™ Fourier Transform Infrared (FTIR) Spectrometer is used to detect food adulterants and verify authenticity by identifying unique chemical signatures. It also characterizes macromolecules such as fats, proteins, and carbohydrates in food products.

- **Cancer and Biomedical Research:** The Spectrum Two™ Fourier Transform Infrared (FTIR) Spectrometer system helps analyze biochemical alterations in tissues by detecting changes in protein, lipid, and nucleic acid composition. It supports biomarker discovery and metabolite profiling through detailed molecular fingerprint analysis.

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Multiskan FC Microplate Reader

The Multiskan FC Microplate Reader, manufactured by Thermo Fisher Scientific, enables simultaneous analysis of multiple samples arranged in microplates (typically 96-well plates), making it highly suitable for high-throughput experiments such as enzyme assays, protein estimation, ELISA, and cell-based studies.



Key Specifications

Parameter	Specifications
Measurement Principle	Absorbance photometry
Microplate Format	96-well plates
Wavelength Range	340 – 850 nm
Light Source	Halogen lamp
Detector	Silicon photodiode
Measurement Modes	Endpoint, Kinetic, Multi-wavelength
Shaking Function	Linear shaking before measurement
Read Time	< 10 seconds per plate
User Interface	Integrated display with keypad control

Signature Features

- **High-Throughput Analysis:** The Multiskan™ FC Microplate Reader enables simultaneous analysis of up to 96 samples (or more, depending on plate format), drastically reducing experimental time compared to single-cuvette spectrophotometry. This makes it ideal for large-scale screening, enzyme kinetics, and clinical assays.

- **Flexible Wavelength Selection:** The Multiskan™ FC Microplate Reader supports multiple optical filters or monochromators for absorbance measurements across the UV–Visible range. This flexibility allows it to perform diverse biochemical assays such as protein estimation, ELISA, nucleic acid quantification, and cell viability tests.
- **Built-in Incubation and Shaking:** Integrated incubation and shaking functions ensure uniform temperature control and proper mixing of reagents. This enhances reaction consistency, improves assay sensitivity, and supports kinetic studies.
- **Standalone Operation:** The Multiskan™ FC Microplate Reader is equipped with an integrated display screen and keypad that can function independently without requiring constant computer connectivity. This feature simplifies operation in routine laboratory settings.
- **Data Accuracy and Reproducibility:** The Multiskan™ FC Microplate Reader provides precise optical detection and consistent well-to-well measurement, ensuring reliable and reproducible quantitative results for biological and biochemical experiments.

Research Applications

- **ELISA (Enzyme-Linked Immunosorbent Assay):** A Multiskan™ FC Microplate Reader measures colorimetric changes in ELISA assays to quantify hormones, cytokines, antibodies, and antigens with high sensitivity. It is widely used in clinical diagnostics, immunological studies, and disease biomarker research.
- **Protein Quantification:** It supports Bradford, Lowry, and BCA assays in a microplate format, allowing simultaneous estimation of multiple protein samples. This high-throughput capability is ideal for research laboratories handling large sample numbers.
- **Cell Biology Studies:** The Multiskan™ FC Microplate Reader is commonly used for cell viability and proliferation assays such as MTT, XTT, and resazurin assays. It also enables cytotoxicity analysis by measuring changes in absorbance linked to cell metabolic activity.
- **Enzyme Activity Assays:** The Multiskan™ FC Microplate Reader allow kinetic monitoring of enzymatic reactions by recording absorbance changes over time. This helps in determining reaction rates, enzyme kinetics, and inhibitor effectiveness.
- **Microbial Growth Analysis:** It measures optical density at 600 nm to monitor bacterial growth in liquid cultures. This enables real-time assessment of microbial proliferation and growth curve analysis.
- **Drug Screening and Biomedical Research:** The system is extensively used to evaluate drug responses in cultured cells and assess therapeutic efficacy. It also facilitates high-throughput screening of bioactive compounds in pharmaceutical research.

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Leica ICC50 E Microscope

The Leica ICC50 E Integrated Digital Microscope is a compound light microscope integrated with a high-resolution digital imaging system, enabling both direct visual observation and real-time image capture. The instrument is widely used for examination of biological specimens such as cells, tissues, microorganisms, and stained slides under different magnifications.



Key Specifications

Parameter	Specifications
Microscope Type	Compound Light Microscope with Integrated Camera
Observation Mode	Bright-field microscopy
Objectives	4×, 10×, 40×, 100× (oil immersion)
Eyepiece	10× wide-field
Illumination Source	LED transmitted illumination
Imaging System	Built-in digital camera (ICC50 E)
Magnification Range	40× – 1000×
Focusing System	Coarse and fine adjustment knobs
Stage Type	Mechanical movable stage
Connectivity	USB / HDMI / Wi-Fi imaging capability

Signature Features

- **Integrated Digital Imaging:** The built-in ICC50 E camera allows image and video capture without the need for external camera attachment, facilitating documentation and analysis.
- **High Optical Clarity:** Advanced Leica optics provide sharp contrast and high-resolution visualization of microscopic specimens.

- **LED Illumination System:** Energy-efficient LED lighting of the Leica ICC50 E Integrated Digital Microscope ensures uniform illumination with minimal heat generation, suitable for prolonged observation.
- **Ergonomic Design:** Smooth focusing of the Leica ICC50 E Integrated Digital Microscope controls and mechanical stage enable precise specimen positioning and comfortable operation during extended laboratory sessions.
- **Real-Time Display and Sharing:** The Real-Time Display and sharing feature of the Leica ICC50 E Integrated Digital Microscope, developed by Leica Microsystems, enables live streaming of microscopic observations directly onto projectors, monitors, or computer screens. This allows instructors to demonstrate specimens simultaneously to an entire classroom and facilitates collaborative analysis during research discussions. It enhances interactive learning, immediate feedback, and group-based scientific interpretation.

Research Applications

- **Cell Biology and Histology:** The Leica ICC50 E Integrated Digital Microscope enables detailed observation of animal and plant cells, supporting tissue section analysis and staining studies. Its digital imaging capability allows accurate documentation of cellular structures for research and comparative analysis.
- **Microbiology:** The Leica ICC50 E Integrated Digital Microscope facilitates identification of bacteria, fungi, and other microorganisms through clear visualization of morphology and staining characteristics. The system is particularly useful for Gram staining interpretation and microbial structural studies.
- **Clinical and Diagnostic Studies:** The Leica ICC50 E Integrated Digital Microscope supports examination of blood smears and cytological specimens, aiding in preliminary pathological assessment. High-resolution imaging assists in observing cellular abnormalities and disease-related morphological changes.
- **Molecular and Biotechnology Research:** The Leica ICC50 E Integrated Digital Microscope used for monitoring cultured cells and verifying sample integrity before conducting molecular experiments such as PCR or DNA extraction. Digital imaging ensures proper documentation of sample quality and experimental conditions.
- **Educational and Training Applications:** The Leica ICC50 E integrated digital display system enhances undergraduate and postgraduate laboratory teaching through live image projection. It promotes interactive learning, digital documentation, and skill development in microscopy techniques.