AutoIMAGE FT-IR Microscope System
Workhorse system for high quality and dependable results

Introduction

The AutoIMAGE™ FT-IR microscope system is a workhorse FT-IR microscopy system that delivers high quality and dependable results – fast. Featuring full automation and integrated software control, the AutoIMAGE simplifies data collection, speeding analysis and improving the quality of results.

The AutoIMAGE has been designed for optimum IR performance with over 50 years of infrared microscopy experience built into its design. Tested to the highest standards, the AutoIMAGE FT-IR microscope delivers the highest sensitivity in its class while its proven technology platform provides reliability, day-in, day-out. Accurate results and reduced analysis times have made the AutoIMAGE the microscope of choice in hundreds of analytical laboratories throughout the world.

Faster analysis

Full automation of all microscope functions means that time-consuming adjustments to focus, aperture and sample position are no longer necessary. With AutoIMAGE, all the microscope operations are controlled from within the software using your PC mouse (Figure 1).

Key Features

- Full automation
- Excellent sensitivity
- Integral interactive collection and display software
- High-throughput, permanently aligned optics
- Transmission, reflectance and ATR modes
- Single-point, multi-point, linescan, mapping, ATR mapping and Auto Focus mapping
- Available for Spectrum™ One and Spectrum GX FT-IR Spectrometers

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Key automated operations include:

- **Auto Aperture** – The measurement area is defined directly on the on-screen, live visible image of the sample using the mouse. When a point is scanned, the AutoIMAGE microscope system instantly switches from View to IR mode and a set of precision motorized aperture blades are automatically driven into place.

- **Auto Marker** – Store locations of interest as you navigate around the sample by marking them directly on the visible image. Markers store focus information so that revisiting points on an uneven sample does not require refocusing. Aperture dimensions are also saved, ensuring that a series of different sized sampling areas can be measured in an automated sequence without operator intervention. All markers are saved along with stored visible images and linked to individual spectra, ensuring data traceability.

- **Auto Focus** – Single-click Auto Focus links to the Auto Marker function to find and store precise focus positions across your sample. In addition, Auto Focus allows visible refocusing during unattended operations – for the first time, mapping of rough-surfaced or curved samples is possible.

- **Auto Correction** – For transmission measurements, the microscope optics are automatically adjusted to compensate for samples of different thickness or refractive index. This ensures that optimum sensitivity and spatial resolution is maintained for all samples.

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**Key applications**

- Product development studies
- Non-routine product quality investigations

**Key industries**

- Academia
- Agriculture
- Chemicals
- Consumer goods
- Food
- Pharmaceuticals

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Figure 1. A typical AutoIMAGE software screen display showing (clockwise from top left): a) marked points on a visible image, b) linked spectra, c) control panel, d) a band area map and e) stacked spectra from a linescan.

Figure 2. AutoIMAGE’s efficient optical layout is optimized for high-sensitivity measurements.
Simple and rapid data collection

With the AutoIMAGE microscope system, data collection couldn’t be simpler:

• View
With AutoIMAGE’s simultaneous variable magnification (SVM) feature, you have access to continuously variable magnification on-screen views of the sample. This allows you to zoom in on features of interest or view a wide area.

• Mark
Once you’ve identified which areas of the sample you want to measure, simply use the mouse to define either single measurement points, multiple points, a line, or a rectangular map area directly on the visible image.

• Measure
Start the measurement with a single mouse click. The AutoIMAGE microscope system automatically switches from Visible to IR mode before the measurement and back again. During the measurement, the AutoIMAGE microscope system will automatically focus, adjust the aperture size and visit multiple sampling points without user intervention. The system will even automatically rerun background spectra when required, for example, when different aperture sizes are used.

High performance by design

Unlike optical microscope-based designs, the AutoIMAGE microscope system is purpose-built for IR microscopy. This simplifies the optical layout (Figure 2) and provides optimum signal-to-noise performance for even the smallest samples. All key optics are permanently aligned and need no realignment before use, saving valuable time and ensuring that maximum performance is maintained day in, day out.

The AutoIMAGE microscope system also provides the high spatial resolution which is critical for trustworthy measurements on small samples. Figure 3 shows clean spectra and a line scan from a 7 layer polymer laminate including several layers which are around 10 µm in thickness.

For thick or non-reflective samples, micro-ATR measurements are an ideal way to obtain high-quality surface spectra, especially when sample preparation is undesirable. AutoIMAGE’s unique micro-ATR design means that you don’t need a separate objective for ATR measurements – simply lower the crystal onto the sample when it’s needed. The high-throughput crystal speeds the collection of high-quality data from even the toughest samples, and multi-point measurements such as ATR mapping are also fast and straightforward (Figure 4).
Display modes

The maximum information about compositional change is easily extracted using a set of powerful display tools for map and linescan data. Display types include surface projections (Figure 5), wire grid projections, false color and contour maps. Data processing includes single-wavenumber, band area and band ratio maps. Using PerkinElmer’s unique COMPARE™ algorithm, a target spectrum can be specified and all the spectra in a map can be matched against it to display a correlation map, or the target spectrum can be subtracted from every point in a map to remove matrix effects, for example. IR maps can also be overlaid to show the distribution of multiple components throughout a sample.

Specifications summary

Principle

Full automation of all FT-IR microscope operations from interactive multimedia AutoIMAGE software. Includes motorized sample stage, integral CCD video camera and video capture card.

Auto Aperture

Motorized aperture blades automatically conform to the required sampling area.

Auto Focus

One-touch automatic focusing. Also provides automatic refocusing for sample points.

Auto Marker

Interactive selection of sampling points directly on the visible image.

Auto Illumination

One-touch software control of integral 35 W tungsten halogen illuminator.

Auto View

Automatic switching of microscope configuration between View and IR modes.

Auto Correction

Automatic adjustment of motorized lower cassegrain to correct for samples of differing thickness and refractive index.

Auto Mode

Point-and-click automatic change-over between transmission and reflectance modes.

Simultaneous Variable Magnification

Continuously variable magnification. Several views of the sample at different magnifications can be viewed simultaneously.

Multimode ATR-Objective

Requires no objective change or realignment when changing between transmission, reflectance and micro-ATR measurements.

IR Performance

Typically 9000:1 p/p signal-to-noise measured using a 100 µm diameter aperture, 4 cm⁻¹ resolution, 2-minute data collection time, between 2200-2100 cm⁻¹ using a narrow- or medium-band MCT detector. A wide-band MCT detector is also available for measurements down to 450 cm⁻¹.

Spatial Resolution

Better than 10 µm.

Figure 5. Surface projection IR Maps showing an impurity in a polymer film (left) and additive distribution (right).