

Infrared Spectroscopy

Frontier FT-IR Spectrometer



Frontier IR/NIR with UATR and NIRA sampling systems

Introduction

The PerkinElmer Frontier™ is the gold standard in FT-IR and FT-NIR spectrometers, enabling laboratories to obtain the highest quality and most reproducible data with exceptional ease. A broad range of “plug-and-go” sampling accessories and software packages ensure the best solution for a range of applications. Whatever your specific laboratory requirements, the Frontier delivers best-in-class accuracy, precision and reliability ensuring the utmost confidence in your results.

PerkinElmer Frontier FT-IR spectrometers are built to the highest ISO-9001 manufacturing standards. This document presents technical information and typical performance specifications for the Frontier FT-IR instruments based on recent factory tests.

OPTICAL PERFORMANCE		
Wavelength Range ¹	8,300 – 350 cm ⁻¹ optimized, proprietary KBr beamsplitter 7,800-225 cm ⁻¹ with CsI beamsplitter option	For optimised NIR operation, the Frontier FT-NIR is available. See separate technical specification sheet for details.
Spectral Resolution	0.4 cm ⁻¹ for the 3028 cm ⁻¹ band in Methane	
Wavenumber Precision	0.008 cm ⁻¹ at 2,000 cm ⁻¹	
Wavenumber Accuracy	0.02 cm ⁻¹ at 2,000 cm ⁻¹	
Signal-to-noise	10,000:1 peak-peak, 5 seconds 34,000:1 peak-peak, 1 minute	15000:1 peak-peak, 5 seconds 50,000:1 peak-peak, 1 minute with high performance pack

OPTICAL SYSTEM	
General	Sealed and desiccated optical unit. Vibration isolated baseplate.
Interferometer	Improved rotary Michelson interferometer for fast scanning, self-compensating for dynamic alignment changes due to a tilt and shear, incorporating high reflectivity, first-surface aluminum-coated optics.
Optics	Kinematically mounted, zero alignment optics.
Mirrors	High reflectivity and a low-angle off axis design.
Detectors	Capabilities for two permanently installed internal detectors, plus external detector via General Purpose Optical Bench (GPOB). Single software click to switch active detectors. For internal detectors, choose from: <ul style="list-style-type: none"> • DTGS (standard) • Liquid-nitrogen-cooled mercury cadmium telluride (MCT) detector (option).
Source	Long-life source with proprietary hot-spot stabilization. User replaceable.
Beamsplitter	<ul style="list-style-type: none"> • Proprietary extended range KBr • Extended range CsI option
Desiccant	Accepts disposable packs or rechargeable desiccant cartridges. Visible desiccant lifetime indicator.
External Beam Ports	Optional external beam ports providing 2 additional output plus 1 additional input beam.
General Purpose Optical Bench (GPOB)	Optional optical bench available for custom accessories and detectors.
Validation	Software controlled validation wheel containing a polystyrene reference material, traceable to a NIST standard for wavenumber accuracy and a Schott NG11 filter for ordinate repeatability.
Full Optical Upgradeability	Single range Frontier systems can be upgraded to multi-range IR/NIR or IR/FIR optical benches.

DATA SYSTEM AND ELECTRONICS	
Signal sampling	Over-sampling delta-sigma converter.
Communication	TCP/IP interface allows direct connection with LAN. Instruments can be configured with their own IP address allowing control via the internet.
Calibration Transfer	Optional Virtual Instrument (AVI) – actively standardizes instrument response to further improve repeatability and protect data integrity.
Atmospheric compensation	Minimizes effect of atmospheric water and CO ₂ on the sample spectra without the need for reference or calibration spectra. Operates at various instrument settings without having to recalibrate the correction.
Accessory recognition	Frontier accessories and ATR top plates are automatically detected as soon as they are locked into the sampling area. Instrument parameters are optimized for the installed accessory. Serial numbers for accessories and top plates are stored with all data.
Error Trapping	All sample spectra are checked for common spectroscopic and sampling problems. Key instrument components are continuously monitored.

BENCH DETAILS	
Size	520 mm x 600 mm x 300 mm (W x D x H).
Weight	34 kg

SOFTWARE	
General	A single software platform incorporates all of the functions required for infrared analyses; instrument control, data manipulation and analysis, and flexible report utilities. A suite of optional software packages provide advanced capabilities or functions designed for specific application areas.
Sample Table	Increases productivity by enabling multiple samples to be defined in batches. Integrates with Go button allowing remote continuous operation.
User Interface	Password-protected user login function. Access to methods and routines, menu, toolbar and toolbox functions can be controlled by a supervisor.
Reports	Quick print facility for graphs, spectra and results windows. User defined templates can be created to enable custom printed and electronic reports.
Processing	1st-4th derivative with a variable filter, smooth (Savitsky-Golay, moving average and triangular), difference, normalization, A, %T, %R, KM, LOG (1/R), ordinate modes, cm ⁻¹ , nm and micron abscissa modes, +, -, *, /, difference, baseline correction, smooth, deconvolution, normalize, interpolate, blank, Kramers-Kronig, ATR correction, peak table, peak height and peak area.
Materials testing	Patented COMPARE™ spectral comparison algorithm and Euclidean searching. Spectral searching against commercially available or customer-developed libraries.
Quantitative analysis	Single frequency, method development software. Includes Beer's Law, PLS and PCR quantitative prediction.
Validation	Instrument performance and user configurable system suitability routines available as standard. Instrument Scheduler facility allows auto-programming of instrument validation testing.
Macros	Macro Editor and Equations Editor provide the ability to setup sequences of data collection and custom spectral processing. These procedures can then be stored and repeated using a single mouse click.
User training	Use, common maintenance and software operation. Context-sensitive help provides assistance throughout the software.
Optional Software packages	
21 CFR Part 11	Enhanced Security™ (ES) software meets the technical requirements for the FDA's 21 CFR Part 11.
Macros	Advanced macro programming that provides access to instrument functionality through a graphical programming interface while also providing access to Microsoft's® powerful Visual Basic® development environment.
Sample Analysis Workflows	AssureID™ software designed for FT-IR and FT-NIR materials testing and product verification. Supports Mid-IR and NIR products testing through a customizable wizard-style interface. Simple turnkey Compare, SIMCA, quantitative analyses with user defined instructions and reports can be readily configured. OLE-DB compliant data storage with ES and non-ES versions available.
Quantitative analysis	Optional method development software for PLS and PCR quantitative method development. Includes Expert Assist for method troubleshooting.
Validation CD	Data validation CD contains test algorithm descriptions, test data and results for data transform algorithms. Comprehensive IQ/OQ documentation and services available.