



FT-NIR ANALYZER

FT-NIR Analyzer - ToronNIR™ 12000

ToronNIR™ 12000 FT-NIR analyzer delivers rapid, non-destructive composition testing for grain, feed, food, and agricultural products. The instrument reads a sample's near-infrared spectrum and returns values such as moisture, protein, fat, starch, and ash in under a minute, with no reagents and little or no sample preparation. A computer-controlled rotating sample cup turns the sample during measurement, so the reading reflects a representative volume rather than a single spot. This makes the ToronNIR™ 12000 a practical tool for high-throughput quality control at intake, in process, and at release.

The analyzer works across the 12,000 to 3,800 cm^{-1} range (800 to 2,600 nm), where the overtone and combination bands of water, protein, fat, and carbohydrate appear. A solid-state laser and a calcium fluoride beamsplitter hold wavenumber accuracy steady, and automatic background scanning corrects for shifts in room temperature and humidity. Built-in OQ and PQ self-verification supports laboratory qualification routines, while automatic model optimization ranks calibration results by RMSECV to speed method development.

The ToronNIR™ 12000 serves grain processors, feed mills, dairies, food manufacturers, and commodity inspectors who need fast composition data without wet chemistry. Analysis software builds, optimizes, and applies calibration models, so a lab can extend the instrument to new products and properties over time. A supplied set of sample cups, tubes, and a reflection block covers common grain, powder, and liquid formats.

APPLICATIONS

FT-NIR Analyzer - ToronNIR™ 12000 Applications

The ToronNIR™ 12000 supports fast composition analysis across the grain, feed, oilseed, and food supply chains.

- Grain and Cereal Processing: measures moisture, protein, wet gluten, starch, and related quality indicators in wheat, rice, and corn.

- Animal Feed Production: determines protein, fat, fiber, moisture, ash, and amino acid indicators in feed raw materials and finished feed.
- Oilseeds and Meals: reports oil, protein, and moisture in soybean, rapeseed, and cottonseed and their processed meals.
- Dairy and Milk Powder: checks fat, protein, moisture, lactose, and sucrose in whole, formula, and specialty milk powders.
- Food Manufacturing and Quality Control: verifies ingredient composition and finished-product consistency during production.
- Commodity Trading and Inspection: grades incoming grain and oilseed lots quickly to support purchasing and acceptance decisions.
- Research and Method Development: builds and validates near-infrared calibration models for new products and properties.



FEATURES

FT-NIR Analyzer - ToronNIR™ 12000 Key Features

The ToronNIR™ 12000 combines fast, reagent-free measurement with tools that keep calibrations accurate over time.

- Non-Destructive, Reagent-Free Analysis: reads composition directly from the sample with no wet chemistry, waste, or consumables.
- Rapid Multi-Parameter Results: reports moisture, protein, fat, starch, ash, and more from a single scan in under a minute.
- Wide Near-Infrared Range: covers 12,000 to 3,800 cm^{-1} (800 to 2,600 nm) for broad composition coverage.
- Intelligent Dynamic Interferometer: a DSP-driven electromagnetic drive keeps the interferometer permanently collimated for stable spectra.
- Solid-State Laser: provides reliable, long-life wavenumber referencing without a gas laser.
- Calcium Fluoride Beamsplitter: a multi-layer coated CaF_2 beamsplitter is matched to the near-infrared region.
- Automatic Background Scanning: rescans the background when temperature shifts more than 2 °C or humidity more than 0.3 g/m³.
- Built-In OQ and PQ Self-Verification: supports laboratory qualification and instrument traceability routines.
- Automatic Model Optimization: ranks calibration results by RMSECV so operators build and tune models faster.
- Rotating Sample Cup: a computer-controlled 97 mm cup averages the measurement over a representative sample volume.
- Measurement and Analysis Software: builds, optimizes, and applies calibration models for new products and properties.

THEORY & METHOD

Theory and Method

Near-infrared spectroscopy measures how molecular bonds absorb light in the 800 to 2,600 nm region. The bonds that dominate here, C-H, O-H, and N-H, are the same bonds found in water, fat, protein, and carbohydrate, so the near-infrared spectrum carries direct information about a sample's composition. Bands in this region come from overtones and combinations of fundamental vibrations, which makes them weaker and broader than the mid-infrared fingerprint bands but well suited to bulk composition work on grains and feeds.

The ToronNIR™ 12000 records the spectrum with a Fourier transform near-infrared design. An intelligent dynamic interferometer, driven by a DSP-controlled electromagnetic system, keeps the optical path collimated as the moving mirror travels. A solid-state laser tracks mirror position for accurate wavenumber calibration, and the interferogram is converted to a spectrum by a Fourier transform. This approach gives high wavelength accuracy and fast measurement across the full near-infrared range.

Turning a spectrum into a concentration takes calibration. Overlapping bands mean no single wavelength maps to one component, so the software applies chemometric models built from samples of known composition. Automatic model optimization ranks results by RMSECV, which helps operators build and refine calibrations quickly. The rotating 97 mm sample cup averages the reading over a larger volume, and automatic background scanning removes drift when temperature or humidity changes during a session.

TECHNICAL SPECIFICATIONS

FT-NIR Analyzer - ToronNIR™ 12000 Technical Specifications

Parameter	Specification
Measurement Principle	Fourier transform near-infrared (FT-NIR)

Parameter	Specification
Interferometer	Intelligent dynamic interferometer, DSP electromagnetic drive, permanently collimated
Detection Range	12,000 to 3,800 cm^{-1} (800 to 2,600 nm)
Resolution	Better than 1 cm^{-1}
Laser	Solid-state laser
Beamsplitter	Multi-layer coated calcium fluoride (CaF_2), near-infrared
Wavenumber Precision	Better than $\pm 0.02 \text{ cm}^{-1}$
Wavenumber Accuracy	Better than $\pm 0.03 \text{ cm}^{-1}$
Wavenumber Repeatability	0.05 cm^{-1}
Automatic Background Scan	Triggered when ambient temperature changes $> 2 \text{ }^\circ\text{C}$ or humidity $> 0.3 \text{ g/m}^3$
Self-Verification	Built-in OQ / PQ system
Model Optimization	Automatic, ranked by RMSECV

Standard Configuration

Item	Quantity	Description
FT-NIR Spectrometer Main Unit	1	Main analyzer unit
Sample Rotator	1	97 mm diameter, computer-controlled rotation and stop
Quartz-Bottom Sample Cups	2	97 mm diameter, for the rotating table
Sample Tubes	256	22 mm diameter
Through-Reflection Block	1	For 22 mm tube samples
Correction Attachment	1 set	For background deduction

Item	Quantity	Description
Measurement and Analysis Software	1 set	Model building, optimization, and analysis



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