



## Thermo Scientific Portable XRF Analyzers

- Lightweight, portable, field-ready
- Exceptionally fast, easy to use
- Nondestructive testing with minimal sample preparation

## Mining and exploration

Solutions from early-stage discovery through mineral processing

# Overview

With substantial capital investments at stake, mining companies that will have a competitive advantage are those that identify and quickly recover the most economically viable resources. Miners are seeking portable technologies for rapid sample analysis that will enable them to increase their discovery success rates, target the highest quality deposits, and increase productivity – and profits – ahead of their competitors. We offer an unmatched portfolio of analytical, process control and measurement technologies to the mining industry. Our solutions include belt scales, conveyor accessories, laboratory and on-line analyzers, and we are the world's leading producer of portable x-ray fluorescence (XRF) analyzers.

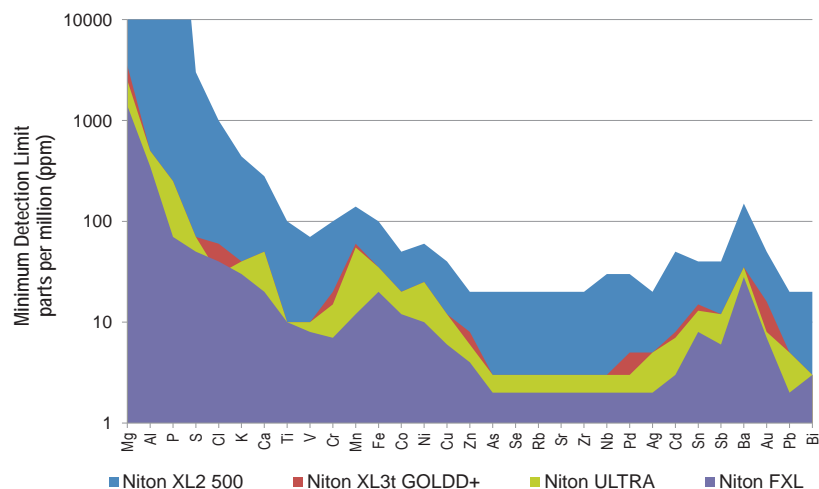


## Designed for rugged field environments

**Thermo Scientific™ portable XRF analyzers for elemental analysis serve many applications in mining and exploration, including outcrop and soil analysis, advanced exploration and drilling, core sample analysis, mine mapping, ore trading, grade control, and cuttings analysis for mud logging and reservoir characterization, requiring light element analysis, in oil and gas exploration and production (E&P).**

Timely sample analyses are critical to determine ore boundaries and drilling targets, develop geochemical mapping, perform grade control, discern stratigraphy, and perform other key operations. Traditional mining sample analysis often involves a costly and time-consuming process of sending samples to off-site laboratories and waiting days, or even months, for critical data. On-site mobile laboratories have sometimes proven difficult to maintain and the related analytical equipment is often inadequate in terms of ruggedness, ease-of-use, and portability.

Portable XRF solutions are making a critical difference in mining exploration and industry operations worldwide by providing fast, reliable data through an easy-to-use platform employing optimized tools, regional service and local expertise.







### Mining Industry Challenges

- Exploration data for mapping and financial reporting
- Rapid identification of increasingly low-grade deposits
- Immediate feedback for drilling operations

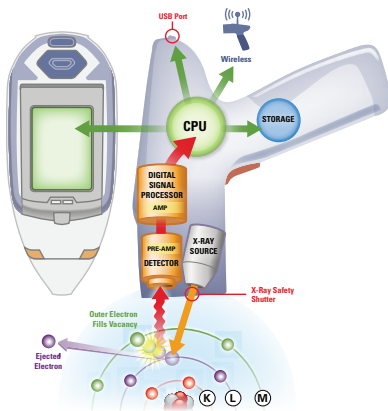
## Thermo Scientific Portable Solutions

From the superior performance of our Thermo Scientific™ Niton™ FXL Field X-ray Lab to our handheld Thermo Scientific™ Niton™ XL2 and XL3 Series, we offer advanced in-situ geochemical analysis of a wide variety of samples including outcrops, direct soils, direct rocks, cuttings, cores, and prepared samples (bags, pellets, cups). Process innovations include:

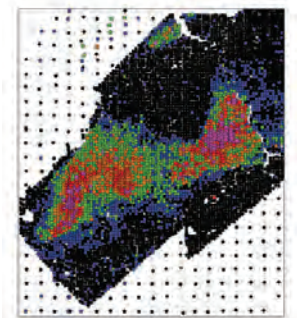
**Speed:** Our portfolio of portable XRF analyzers offer real-time analysis capabilities to enable quick decisions, including whether to drill or not to drill, equipment relocation considerations, where to focus on the grid, and when to take a proper sample for laboratory analysis.

**Real-Time Reporting:** Field analyses provide for faster delineation of drill targets for timely operational and financial reporting back to management and/or investors.

**Increased Sample Density:** Running more assays in the field allows for finer grid resolution and the ability to send prequalified samples to an off-site laboratory. With improved statistics, this high-density analysis produces a more comprehensive picture of the target than the exclusive use of the traditional bag and lab method.



How x-ray fluorescence (XRF) works



High-density soil analysis and copper distribution map

© Tigray Resources.  
Prepared by CEC Geology LLC  
using MapInfo Professional  
thematic mapping.

*“Knowledge is the key, and [Thermo Scientific] Niton XRF gives us on-the-spot knowledge. This facilitates decision-making, resulting in time and cost savings.”*

– Andrew Gillies, Managing Director, Metallica Minerals Limited



# Engineered for the way you work

## Take your lab with you

All Thermo Scientific portable XRF units feature a lightweight, compact design and operate reliably in harsh field environments. Our portable handheld analyzers can be operated directly in the field, or in a test stand for mobile laboratory use. Our field x-ray labs can be operated in the field on a tripod, in the back of a truck, or in on-site labs, providing a total sample testing solution.

Our analyzers feature sealed construction using tough LEXAN™ plastic, and are dust- and water-resistant for worry-free use virtually anywhere on-site. One-step system check requires no external accessories while advanced battery technology supports extended continuous operation on a single charge. All units feature a bright, color LCD screen.

## Fast and easy to use

Portable XRF analyzers featuring GOLDD™ technology (Geometrically Optimized Large Drift Detector), provide faster measurement times and lower detection limits – up to 10-times faster than conventional Si-PIN detectors and up to 3-times more precise than conventional smaller silicon drift detectors (SDD).

Simply point and shoot the handheld analyzers, or place the sample in the Niton FXL field x-ray lab and close the lid to get a reliable reading in seconds. Unlike destructive testing methods, samples remain intact and undamaged. All portable analyzers easily accommodate a wide variation of samples, with little or no sample preparation, depending on the required accuracy.

For measuring samples of unknown chemical composition in which concentrations of light and heavy elements may vary from parts per million (ppm) to high percent levels, our XRF analyzers feature Fundamental Parameters (FP) calibration to simultaneously compensate for a wide variety of geometric effects, x-ray absorption, and secondary and tertiary fluorescent effects. This universal calibration requires minimal training and measures the full range of element concentrations in a wide variety of samples without any additional user input.



# Which XRF analyzer is right for you?

	name	description	performance	applications
	Thermo Scientific™ Niton™ XL2	<ul style="list-style-type: none"> <li>• <b>Value Leader</b></li> <li>• Economical PIN detector</li> <li>• Fixed color screen</li> <li>• Handheld, point and shoot</li> </ul>	<ul style="list-style-type: none"> <li>• Element analysis range up to 33 elements</li> <li>• 45 kV/100 µA max excitation</li> </ul>	<ul style="list-style-type: none"> <li>• Grade control</li> <li>• Ore trading</li> <li>• Exploration for base and ferrous metals</li> </ul>
	Thermo Scientific Niton XL3t	<ul style="list-style-type: none"> <li>• <b>Feature Leader</b>; solution with enhanced features</li> <li>• Economical PIN detector</li> <li>• Embedded GPS</li> <li>• Color tilt screen</li> <li>• Optional: CCD camera, small spot</li> <li>• Handheld, point and shoot</li> </ul>	<ul style="list-style-type: none"> <li>• Highest sensitivity and measurement accuracy</li> <li>• Element analysis range up to 32 elements</li> <li>• Better excitation for heavy elements/REEs</li> <li>• 50 kV/100 µA max excitation</li> </ul>	<ul style="list-style-type: none"> <li>• Outcrop/early stage exploration</li> <li>• General purpose mine site</li> <li>• Heavy elements</li> <li>• Grade control</li> <li>• Exploration for base and ferrous metals</li> </ul>
	Thermo Scientific Niton XL3t GOLDD+	<ul style="list-style-type: none"> <li>• <b>Market Leader</b>; balance of performance and features</li> <li>• 25mm<sup>2</sup> Silicon Drift Detector (SDD)</li> <li>• Same as XL3t plus standard CCD camera</li> <li>• Optional He purge</li> </ul>	<ul style="list-style-type: none"> <li>• Optimized analysis speed</li> <li>• Better excitation for heavy elements/REEs</li> <li>• Element analysis range up to 37 elements</li> <li>• 50kV/200 µA max excitation</li> </ul>	<ul style="list-style-type: none"> <li>• Advanced exploration and soil analysis</li> <li>• Concentrate measurement</li> <li>• Ore blending</li> <li>• Lab analysis prequalification</li> <li>• Precious metal pathfinders</li> </ul>
	Thermo Scientific Niton XL3t Ultra	<ul style="list-style-type: none"> <li>• <b>Performance Leader</b></li> <li>• 45mm<sup>2</sup> Silicon Drift Detector (SDD)</li> <li>• Same as XL3t GOLDD+ plus standard CCD camera</li> </ul>	<ul style="list-style-type: none"> <li>• Enhanced light element analysis</li> <li>• Same element analysis range as XL3t GOLDD+</li> <li>• 50kV/200 µA max excitation</li> </ul>	<ul style="list-style-type: none"> <li>• Advanced exploration and soil analysis</li> <li>• Mud logging</li> <li>• Specialty applications in oil/gas</li> <li>• Ore deposit modeling/mapping</li> </ul>
	Thermo Scientific Niton FXL	<ul style="list-style-type: none"> <li>• <b>Mobile Laboratory Solution</b></li> <li>• 45mm<sup>2</sup> Silicon Drift Detector (SDD)</li> <li>• Closed-beam design</li> <li>• Optional sample spinner/pellet holder for reducing sample heterogeneity issues</li> <li>• Optional X-Y positioning for fine adjustment of the XRF beam</li> <li>• Optional 1mm and 3mm spot sizes</li> <li>• CCD camera</li> <li>• Optional He for ultra low Mg and Si</li> </ul>	<ul style="list-style-type: none"> <li>• Enhanced light element analysis including z-CAL™</li> <li>• Element analysis range up to 42 elements</li> <li>• Highest performance and lowest levels of detection</li> <li>• 50kV/200 µA max excitation</li> </ul>	<ul style="list-style-type: none"> <li>• Oil and gas exploration</li> <li>• Bauxite and penalty elements in coal and Fe ore without the need for helium purge or vacuum</li> <li>• Industrial minerals including limestone for cement production</li> </ul>



# Applications

Thermo Scientific portable analyzers can be used in the exploration and mining of a wide variety of base metals, precious metals, rare earth elements, mineral fuels, industrial minerals, and gas-bearing strata samples.

## Exploration

Portable XRF analyzers provide fast acquisition of geochemical data for rapid delineation of ore boundaries and the in-depth, quantitative analysis of metal concentrations for mine mapping. Lead times are reduced, which can be critical if the exploration season is short.



- Early stage exploration: soil survey and outcrop evaluation
- Advanced exploration and drilling: trend analysis to identify decreasing or increasing pattern of elements of interest which can help to make “continue” or “stop” drilling decisions on-site, saving time and money
- Ore deposit modeling/mapping

## Quarry Operations

Quickly obtaining accurate exploration assay data to guide mining operations is one of the biggest obstacles to optimal productivity. Portable XRF analyzers allow users to bring the lab to the field, avoiding lab turn around delays and costs. The ability to rapidly acquire and send XRF data to quarry laboratory and operations management personnel allows for easy collaboration and informed decisions.



- General-purpose mine site analyzer
- Provides an analytical alternative to busy labs
- Reduce number of samples sent to the lab and send only pre-screened samples

## Production and Mineral Processing

Fast, laboratory-grade sample analysis is made simple: test your samples on site with little or no sample preparation. Achieve the accuracy needed to provide defensible data for process control, quality assurance, and other operational decisions.



- Grade control
- Delineate ore and waste boundaries
- Ore trading
- Concentrate measurement

## Oil & Gas Exploration & Production

Portable XRF analyzers are valuable for upstream exploration and production, offering rapid, on-site chemical analysis of rocks, cuttings, and cores that can be used for identifying formations and determining mineral composition of the rock. Users can infer mineralogical properties favorable to oil and gas production from data collected in real-time. Niton FXL analyzers are ideal for light element and trace metal analysis required for gas shale applications.



- Advanced exploration and drilling
- Mud logging
- Mineralogy and lithology inference
- Chemostratigraphy

## Industrial Minerals

Portable XRF analyzers are an emerging instrument of choice for in-quarry exploration and evaluating the composition of raw materials such as phosphate, potash, gypsum, and limestone for industrial use.



- Ideal for determining penalty elements in limestone, Fe ore, and bauxite
- Blending and sorting of raw materials
- Instantly flag grade, sub-grade, and waste, and prevent taking ore to the waste heap

*“At Madero Project, the [Thermo Scientific] Niton [analyzer] has allowed us to take assay analyses in real time, and make appropriate decisions in our operations in real time, with tremendous savings.”*

– Randolph Lopez, Chief Geologist, Madero Project, Peñoles

# Customize your testing solutions

A full line of options and accessories is available to meet your unique testing requirements.



**Test Stands** – We offer a selection of field-rugged test stands to accommodate a variety of samples including everything from powders and liquids to cups, pellets and direct rock samples (additional test stand options are available other than those shown here).



**Tripod** – Optional tripod for the Niton FXL allows easy set up and operation.



**Extend-a-Pole™** – Telescoping extension pole with analyzer cradle offers remote trigger activation; also features folding bi-pod supports to facilitate in-situ testing while standing upright.

**Sample Prep Tools** – XRF works best with finely disseminated, homogeneous samples. Our portable sampling and preparation tools, which complement the Niton FXL field x-ray lab and other portable XRF analyzers, help bring the laboratory process to the field.



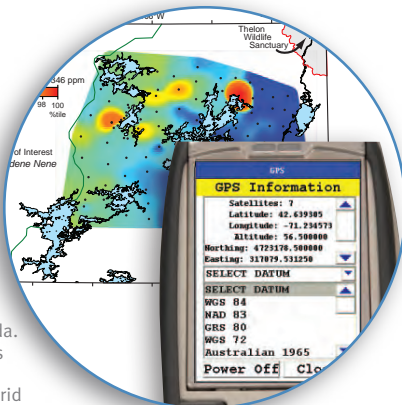
**Electric Hammer Mill Kit** – The Thermo Scientific Electric Hammer Mill Kit includes the first 12VDC powered mill on the market.



**Direct Rock Sampler Kit** – The Thermo Scientific Direct Rock Sampler allows the collection of fine powders from a rock face.

**Leading GPS and GIS Solutions** – All Thermo Scientific Niton XL3t models now offer standard built-in GPS capability as well as optional Bluetooth® connectivity to external GPS systems.

- The Niton Data Transfer (NDT) software provides a means to export geochemical and GPS data to leading GIS platforms
- Document geographic location of each sample as lat/long or UTM
- Seamlessly integrates with mobile GIS devices which allows preparation of geochemical maps instantly in the field



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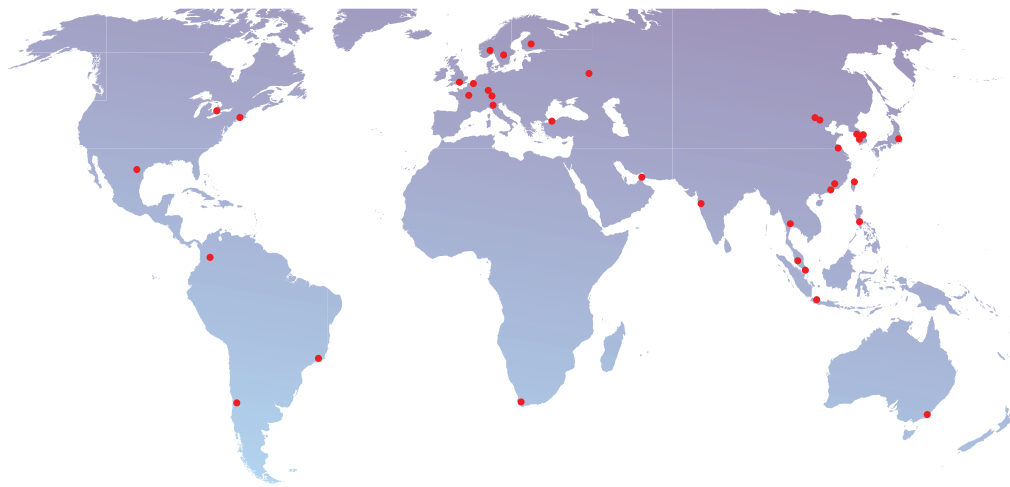


**Delivering critical results to leading mining companies around the world.**

- Anglo American Platinum
- Barrick Gold
- Bell Copper
- CODELCO Exploraciones
- Colorado Goldfields
- Grupo Mexico
- Rio Tinto Mining & Exploration
- Store Norske Gull
- Vale

## Superior XRF analysis solutions, backed by our worldwide sales and service

Thermo Fisher Scientific is a recognized leader in XRF analysis technology. With a dedicated network of more than 70 distributors and 30 factory-trained service centers in 123 countries, we have the global reach to provide best-in-class product support, application consulting, and training to ensure your success.



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