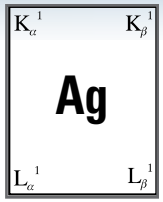
Thermo Scientific

X-RAY ENERGY REFERENCE

H Hydrogen 1																	He Helium 2
Li Lithium 3	Be Beryllium 4											B Boron 5	C Carbon 6	N Nitrogen 7	O Oxygen 8	F Fluorine 9	Ne Neon 10
Na Sodium 11	Mg Magnesium 12											Al Aluminum 13	Si Silicon 14	P Phosphorus 15	S Sulfur 16	Cl Chlorine 17	Ar Argon 18
K Potassium 19	Ca Calcium 20	Sc Scandium 21	Ti Titanium 22	V Vanadium 23	Cr Chromium 24	Mn Manganese 25	Fe Iron 26	Co Cobalt 27	Ni Nickel 28	Cu Copper 29	Zn Zinc 30	Ga Gallium 31	Ge Germanium 32	As Arsenic 33	Se Selenium 34	Br Bromine 35	Kr Krypton 36
Rb Rubidium 37	Sr Strontium 38	Y Yttrium 39	Zr Zirconium 40	Nb Niobium 41	Mo Molybdenum 42	Tc Technetium 43	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Ag Silver 47	Cd Cadmium 48	In Indium 49	Sn Tin 50	Sb Antimony 51	Te Tellurium 52	I Iodine 53	Xe Xenon 54
Cs Cesium 55	Ba Barium 56		Hf Hafnium 72	Ta Tantalum 73	W Tungsten 74	Re Rhenium 75	Os Osmium 76	Ir Iridium 77	Pt Platinum 78	Au Gold 79	Hg Mercury 80	Tl Thallium 81	Pb Lead 82	Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	Ra Radium 88	57- 71															
		89-103	La Lanthanum 57	Ce Cerium 58	Pr Praseodymium 59	Nd Neodymium 60	Pm Promethium 61	Sm Samarium 62	Eu Europium 63	Gd Gadolinium 64	Tb Terbium 65	Dy Dysprosium 66	Ho Holmium 67	Er Erbium 68	Tm Thulium 69	Yb Ytterbium 70	Lu Lutetium 71
			Ac Actinium 89	Th Thorium 90	Pa Protactinium 91	U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

Key to Energy Values



Requires GOLDD technology for metal alloys

Requires GOLDD technology for mining & minerals mode

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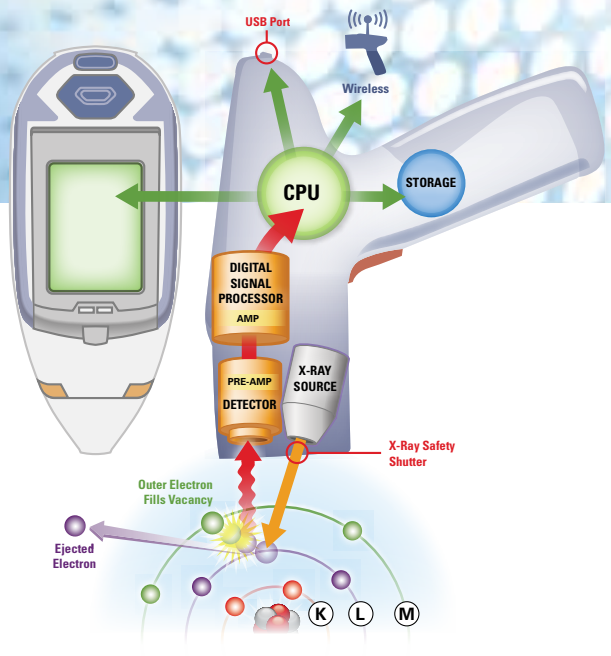
Thermo Scientific Niton XRF Analyzers

Our Thermo Scientific Niton XRF analyzers, now available with groundbreaking **Thermo Scientific Geometrically Optimized Large Area Drift Detector** (GOLDD) technology, bring you the latest in a series of cutting edge, rugged, dependable tools.

- *Easy to use – promotes user adoption and rapid integration into workflow*
- *Real-time traceable results with tamperproof data and simple certificate generation*
- *Nondestructive test doesn't alter or deface sample*
- *Lab-quality performance in a handheld instrument*
- *Light element detection (Mg, Al, Si, P, S) available without helium or vacuum purge*
- *Lower limits of detection and faster analysis than previously available with handheld XRF*
- *Rapidly identify, isolate & analyze individual components, then document results with variable spot size and integrated CCD camera option*

Satisfied customers representing industries from mining to alloy analysis – including the Consumer Product Safety Commission, the U.S. Environmental Protection Agency, and the U.S. Dept. of Homeland Security Customs & Border Protection – have chosen and trust handheld Niton XRF analyzers.



The XRF Analysis Process in Brief

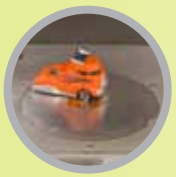
1. Primary x-ray energy is produced by the analyzer and directed at the sample surface.
2. The primary energy causes inner-shell electrons to be ejected from their orbits in individual atoms.
3. Vacancies left by ejected electrons are filled by electrons from outer shells, resulting in emissions of fluorescent x-rays, each of which is characteristic of the element from which it is emitted.
4. The fluorescent x-rays enter the detector, which registers the individual x-ray events and sends electronic pulses to the preamp.
5. The preamp amplifies the signals and sends them on to the Digital Signal Processor (DSP).
6. The DSP collects and digitizes the x-ray events occurring over time, and sends the resulting spectral data to the main CPU for processing.
7. The CPU, using various advanced spectral processing algorithms, mathematically analyzes the spectral data to produce a detailed composition analysis.

   For metal alloy samples, the resulting data is then compared against an internal table or library of min/max specifications to determine an alloy grade or other designation for the tested material.
8. The composition data and any resulting identification is then simultaneously displayed on the instrument screen, and stored in memory for later recall and/or download to an external PC.

The Right Analyzer for Your Application

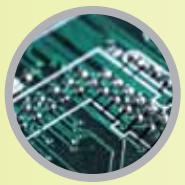
Metal and Alloy Analysis

- Instant, positive grade identification
- Incoming, in-stock, or in-service component testing
- Superior detection limits for tramp/trace elements
- Rugged design engineered for use in harsh environments
- Excellent light element performance for sorting Al, Ti, and bronze alloys
- Lost traceability recovered in seconds
- Lower detection limits for Cr, Cu, Ni, and Mo in carbon steel



Toys and Consumer Goods

- Screen child-accessible products for compliance with CPSIA, EN-71, Proposition 65, and other regulations
- Reduce the risk of recall, civil penalties, and legal judgments
- Screen more samples in less time and at lower cost than exclusive reliance on testing laboratories
- Real-time results mean decisions to ship product can be made immediately
- Lead testing can occur in the factory, lab, warehouse, or on the dock
- Thermo Scientific TestAll technology automatically selects the correct analytical mode



RoHS-WEEE Compliance/Halogen-free

- Total Pb, Cd, Hg, Cr, and Br quantified in matter of seconds
- Pass/fail designations provided for each sample, with visual identification of the out of spec elements
- No special calibrations or other user input – easy to use by shift personnel
- Easily switch from measuring alloys, to plastics and polymers, to mixed materials – coated leads, Cr coatings, populated PCBs, and BFRs for halogen-free screening
- Ideal for high-reliability systems, finished goods, and packaging

Mining Exploration and Geochemical Analysis

- Rapid survey of soil & outcrops to identify potential drill targets
- Direct screening of core & cuttings for real-time decision making on the drill rig – dynamically drive exploration programs
- On-site delineation of mineralization boundaries
- Results at or below the averages naturally found in the earth's crust
- High sample throughput and increased sample density over traditional lab methods

Environmental Analysis

- Rapid identification of contaminants with analytical range from Mg through U
- Lower detection limits reduce reliance on traditional, fixed-site laboratories
- Improved platform yields faster results; survey larger areas in less time
- The Thermo Scientific Extend-a-Pole promotes rapid, ergonomically correct soil surveys
- Wireless GPS integration for elemental mapping with GIS systems

For more detailed information on how XRF works, visit ***www.thermoscientific.com/niton***

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