

H Hydrogen 1	
Li Lithium 3	Be Beryllium 4
1.04 Na Sodium 11	1.07 1.25 Mg Magnesium 12

Key to
Energy Values

K_{α}^1	K_{β}^1
Ag	
L_{α}^1	L_{β}^1



Thermo Scientific

X-RAY ENERGY REFERENCE

0.18 B Boron 5	0.28 C Carbon 6	0.39 N Nitrogen 7	0.53 O Oxygen 8	0.68 F Fluorine 9	0.85 Ne Neon 10
1.49 Al Aluminum 13	1.55 1.74 Si Silicon 14	1.83 2.02 2.14 P Phosphorus 15	2.31 2.46 S Sulfur 16	2.62 2.82 Cl Chlorine 17	2.96 3.19 Ar Argon 18

3.31 K Potassium 19	3.59 Ca Calcium 20	3.69 4.01 Sc Scandium 21	4.09 4.46 Ti Titanium 22	4.51 4.93 V Vanadium 23	4.95 5.43 Cr Chromium 24	5.41 5.95 Mn Manganese 25	5.90 6.49 Fe Iron 26	6.40 7.06 Co Cobalt 27	6.93 7.65 Ni Nickel 28	7.48 8.26 Cu Copper 29	8.05 8.90 Zn Zinc 30	8.64 9.57 Ga Gallium 31	9.25 10.26 Ge Germanium 32	9.89 10.98 As Arsenic 33	10.54 11.73 Se Selenium 34	11.22 12.50 Br Bromine 35	11.92 13.29 Kr Krypton 36			
13.39 Rb Rubidium 37	14.96 Sr Strontium 38	14.16 15.83 Y Yttrium 39	14.96 16.74 Zr Zirconium 40	15.77 17.67 Nb Niobium 41	16.61 18.62 Mo Molybdenum 42	17.48 19.61 Tc Technetium 43	18.41 20.59 Ru Ruthenium 44	19.28 21.66 Rh Rhodium 45	20.21 22.72 Pd Palladium 46	21.18 23.82 Ag Silver 47	22.16 24.94 Cd Cadmium 48	23.17 26.09 In Indium 49	24.21 27.27 Sn Tin 50	25.27 28.48 Sb Antimony 51	26.36 29.72 Te Tellurium 52	27.47 30.99 I Iodine 53	28.61 32.29 Xe Xenon 54			
1.69 1.75 Cs Cesium 55	1.81 1.87 Ba Barium 56	1.92 2.00 Hf Hafnium 72	2.04 2.12 Ta Tantalum 73	2.17 2.26 W Tungsten 74	2.29 2.40 Re Rhenium 75	2.42 2.54 Os Osmium 76	2.56 2.68 Ir Iridium 77	2.70 2.83 Pt Platinum 78	2.84 2.99 Au Gold 79	2.98 3.15 Hg Mercury 80	3.13 3.32 Tl Thallium 81	3.29 3.49 Pb Lead 82	3.44 3.66 Bi Bismuth 83	3.61 3.84 Po Polonium 84	3.77 4.03 At Astatine 85	3.94 4.22 Rn Radon 86	4.11 4.42 Fr Francium 87	4.42 4.83 Ra Radium 88		
30.97 La Lanthanum 57	34.98 Ce Cerium 58	32.19 Pr Praseodymium 59	36.38 Nd Neodymium 60	32.19 Pm Promethium 61	36.38 Sm Samarium 62	34.98 Eu Europium 63	39.09 Gd Gadolinium 64	39.09 Tb Terbium 65	40.78 Dy Dysprosium 66	40.78 Ho Holmium 67	44.96 Er Erbium 68	44.96 Tm Thulium 69	48.96 Yb Ytterbium 70	48.96 Lu Lutetium 71	57-71	89-103	89-103	89-103	89-103	
12.03 Ac Actinium 89	14.77 Th Thorium 90	12.34 Pa Protactinium 91	15.23 U Uranium 92	12.34 Np Neptunium 93	15.23 Pu Plutonium 94	12.34 Am Americium 95	15.23 Cm Curium 96	12.34 Bk Berkelium 97	15.23 Cf Californium 98	12.34 Es Einsteinium 99	15.23 Fm Fermium 100	12.34 Md Mendelevium 101	15.23 No Nobelium 102	12.34 Lr Lawrencium 103	12.34	15.23	12.34	15.23	12.34	15.23

Requires GOLDD technology for metal alloys

Requires GOLDD technology for mining & minerals mode

Americas
Billerica, MA U.S.A.
Phone: +1 978 670-7460
Toll Free: 800 875-1578 (USA)
Fax: +1 978 670-7430
E-mail: niton@thermofisher.com

**Europe, Middle East, Africa
and South Asia**
Munich, Germany
Phone: +49 89 3681 380
Fax: +49 89 3681 3830
E-mail: niton.eur@thermofisher.com

Asia Pacific
New Territories, Hong Kong
Phone: +852 2885 4613
Fax: +852 2869 6665
E-mail: niton.asia@thermofisher.com

www.thermoscientific.com/niton

Thermo
SCIENTIFIC

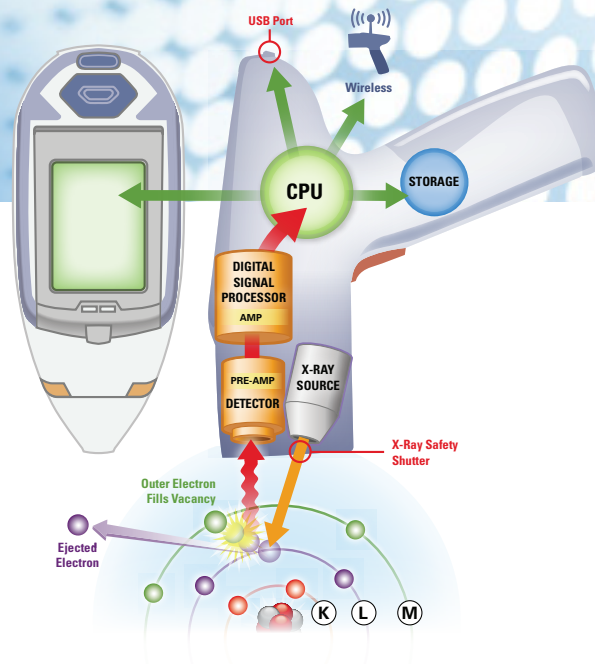
Part of Thermo Fisher Scientific

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



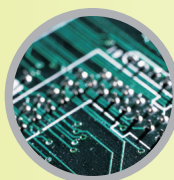
Metal and Alloy Analysis

- 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