

The Thermo Scientific NITON XL3t 900 Series is our second generation, high-performance, truly nondestructive handheld analyzer for light element analysis in alloy material. It provides fast, laboratory-quality chemical analysis of aluminum and titanium alloys, as well as nickel alloys, superalloys, stainless steels, and more.

Thermo Scientific NITON® XL3t 900 Series



NITON XL3t 900 Series analyzers provide many distinct advantages over traditional OES analysis:

- Very easy to use – even by non-technical personnel
- Little to no sample preparation
- Truly nondestructive test with rapid results



Instant in-field results.

The need for material verification is an increasingly important issue across a wide range of industries. Specially engineered alloys that can better withstand the specific stresses and requirements of many different specialized applications are continually being developed. While both necessary and exciting, these new introductions, nonetheless, dramatically increase the complexity of material verification and QC testing needs.

Material inspection is intensely critical in certain industries such as aircraft and aerospace manufacturing, since human lives may depend on the proper performance of alloy components. A simple material mix-up on a commercial aircraft can prove disastrous. On a spacecraft or commercial satellite, it can mean millions of dollars and years of effort

wasted. For a scrap recycling facility, misidentified material can result in a returned load and a loss of consumer confidence.

Thermo Scientific NITON XRF analyzers are designed to quickly and reliably provide accurate alloy material verification, and have become the worldwide standard for material analysis in industries ranging from primary metal production to scrap metal recycling. They provide immediate nondestructive chemical analysis of alloy materials from titanium to nickel superalloys, from castings to fasteners, dip switches to scrap cuttings and turnings, incoming raw materials to final product QC. Further, they also supply fast, nondestructive analysis of high-temp nickel and stainless steel, as well as screening for the presence of prohibited materials such as tin (Sn), selenium (Se), cadmium (Cd), and zinc



Photo courtesy Universal Metal Corporation, Worcester, Mass.

(Zn) in spacecraft applications, and lead (Pb), chromium (Cr), Cd, bromine (Br), and mercury (Hg) for RoHS compliance.

The new NITON XL3t 900 Series instrument takes the analytical capabilities of handheld XRF to a higher level, continuing to fill the void for inspectors or scrap metal sorters who once were forced to turn away from the convenience of handheld XRF to Optical Emission Spectroscopic (OES) instrumentation for light element analysis. Best of all, the nondestructive nature of the XRF technique allows testing of finished or sensitive parts without concern.

Breakthrough Technology with Thermo Scientific NITON XL3 Series Analyzers

Featuring a high-performance thermoelectrically cooled detector, 80 MHz real-time digital signal processing, and dual state-of-the-art embedded processors for computation, data storage, communication, and other functions, the NITON XL3t incorporates a host of new features directly benefiting the customer. From the integrated tilting VIP™ color touch-screen display to customizable menus for ease of use, these ergonomic analyzers are both the lightest weight and most ruggedly constructed instruments that we've ever made, making them appropriate for use under all environmental conditions, both indoors and out. Couple these features with integrated Bluetooth™, USB, and serial communications, and cumbersome download procedures of PDA synchronization become a thing of the past. In addition, all NITON analyzers use third-generation lithium-ion batteries, providing the longest usage cycle of any handheld XRF analyzer.

Light Element Analysis with the Thermo Scientific NITON XL3t 900

When activated, the NITON XL3t 900 Series analyzer fills the

interior of its unique measurement head with pure helium, purging atmospheric air from the x-ray analysis path and allowing light element x-rays to contact its high-resolution x-ray detector. As a result, operators can confidently measure light element alloy content with the same analyzer that they use to test their high-temp alloys.

The NITON XL3t 900 Series analyzer directly quantifies aluminum (Al), silicon (Si) and magnesium (Mg) levels in aluminum alloys, Si in steels, Al in nickel and titanium alloys, and a host of other chemical analyses once unattainable using handheld XRF technology. It provides immediate alloy identification from its comprehensive, user-editable grade library, while the advanced Fundamental Parameters-based chemistry algorithm presents lab-quality compositional data within seconds.

Evaluating Performance

When potential users are evaluating the performance of analytical instrumentation, they are generally concerned with two criteria: speed and accuracy. There are two distinct factors to consider when asking "How accurate is it?":

- Precision – This is a measure of repeatability, or the degree of agreement between individual measurements of a set of measurements, all of the same quantity.
- Accuracy – This is a measure of reliability, and is the difference between the documented values of a Certified Reference Material (CRM) and the measured values of the same material.

Most analytical instrumentation reports statistical precision data along with the quantitative measurement results. Precision is a function of the statistical analysis of the raw data. Accuracy, however, must be determined by testing samples with known values and comparing the measured results to the known values. Since even the best laboratory methods used to provide these values have statistical limitations in both precision and accuracy, true value is never really known, even in a "certified standard."

Regarding XRF instrumentation, the time of measurement improves the precision. With XRF analysis, each fourfold increase in measurement time improves the precision for each element by a factor of 2. At some point, increased measurement time will reach a point of diminishing returns.

Thermo Scientific NITON Analyzers Measure Up

NITON XRF instruments report a two-sigma precision along with the result for each element. This represents an error band of two standard deviations on either side of the result. The two sigma precision represents a 95 percent confidence interval for the data – the ASTM industry standard. Note the precision, or +/- error band, is not an indication of accuracy, but a measurement of repeatability around a most probable value. Accuracy must be assessed by comparing the measured result and precision to known values from a reference standard.

Unparalleled Accuracy

In our performance testing, each alloy sampled was measured under the same conditions. The performance data listed can be considered typical of the instrument configuration used to produce it. Performance of individual instruments of this configuration under varying conditions may differ slightly from those shown here.

Table 1 and Table 2 illustrate both the outstanding accuracy and the precision of our new generation XL3t 900 Series light element alloy analyzer against the values of CRM standards* for ALCAN aluminum alloys AA5052 and AA2024. The indicated times are the seconds of measurement per filter (10 seconds for the main filter, 50 seconds for the light filter).

The accuracy of the measurements coupled with the XL3's unparalleled speed means high throughput with real-time traceable results you can count on.

Limits of Detection for Light Elements

The Thermo Scientific NITON XL3 900 Series utilizes a proprietary Fundamental Parameters (FP) based analysis routine integrated with a unique matrix recognition algorithm for quick and accurate light element analysis results and ID.

| AA5052 | ALCAN 5052 AJ | | NITON Analyzer Data | |
|----------|---------------|-----------|---------------------|-------|
| | Cert | Est.Error | 10/50 Sec | +/- |
| Grade ID | | | 5052 | |
| Mg | 2.60 | 0.060 | 3.00 | 0.400 |
| Si | 0.10 | 0.002 | 0.15 | 0.070 |
| Al | 96.50 | | 96.11 | 0.370 |
| Cr | 0.22 | 0.010 | 0.23 | 0.050 |
| Mn | 0.08 | 0.001 | 0.07 | 0.030 |
| Fe | 0.27 | 0.010 | 0.24 | 0.030 |
| Zn | 0.03 | 0.001 | 0.02 | 0.005 |
| Cu | 0.04 | 0.001 | 0.04 | 0.007 |
| Ni | 0.02 | 0.001 | 0.02 | 0.009 |
| Bi | 0.03 | 0.001 | 0.03 | 0.003 |
| Pb | 0.02 | 0.001 | 0.02 | 0.003 |

Table 1. Performance data for aluminum alloy 5052

| AA2024 | ALCAN 2024 AD | | NITON Analyzer Data | |
|----------|---------------|-----------|---------------------|-------|
| | Cert | Est.Error | 10/50 Sec | +/- |
| Grade ID | | | 5052 | |
| Mg | 1.62 | 0.050 | 1.50 | 0.400 |
| Si | 0.27 | 0.020 | 0.39 | 0.070 |
| Al | 92.30 | | 92.27 | 0.370 |
| Mn | 0.74 | 0.024 | 0.74 | 0.060 |
| Fe | 0.29 | 0.006 | 0.28 | 0.035 |
| Cu | 4.63 | 0.064 | 4.67 | 0.094 |
| Bi | 0.02 | 0.003 | 0.02 | 0.003 |
| Pb | 0.02 | 0.001 | 0.02 | 0.004 |
| Sn | 0.01 | 0.002 | 0.02 | 0.007 |

Table 2. Performance data for aluminum alloy 2024

| Element | Matrix (conc %) | |
|---------|-----------------|-------|
| | Fe | Al |
| Zn | 0.015 | 0.010 |
| Cu | 0.030 | 0.030 |
| Ni | 0.050 | 0.010 |
| Cr | 0.015 | 0.015 |
| V | 0.010 | 0.010 |
| Ti | 0.010 | 0.010 |
| Al | 0.031 | NA |
| Si | 0.075 | 0.150 |
| Mg | 1.300 | 0.650 |

Table 3. Alloy LODs for the NITON XL3t 900 Series analyzer

The data in Table 3 represents the alloy Limits of Detection (LODs) for various elements in iron (Fe) and aluminum, including Al, Si, and Mg. Detection limits are specified following the U.S. EPA protocol of 99.7 percent confidence level. Individual LODs improve as a function of the square root of testing time. For these tests, samples had to be flat, sit directly on top of and cover the entire measurement window, and the surface had to be clean and free of oxidation or other surface films.

Service and Support

Thermo Scientific NITON XL3 900 Series analyzers are designed to be the most dependable analyzers in the history of handheld XRF. From the rugged Lexan® EXL plastic instrument body to the high-performance semiconductor x-ray detector, each individual component has been carefully designed and engineered. When routine service is required, we have more than 30 service centers located on six continents to provide the world-class support expected from the industry leader.

Configurations and Accessories

Providing the optimum alloy analysis systems for almost any organization's analytical and budgetary requirements, Thermo Scientific NITON analyzers offer the widest range of choices in excitation, configurations, and accessories.

With the choice of the most powerful x-ray tubes ever offered in a handheld XRF instrument or the new second generation Thermo Scientific Infiniton™ source with dramatically higher performance, these powerful tools are revolutionizing alloy analysis.

All of our analyzers come with a shielded, waterproof carrying case, belt holster, He tank holster, and PC-compatible NITON Data Transfer (NDT®) software for remote operation, file transfer, data management and advanced data analysis. Optional items include test stands, welding masks, hot surface adaptors, extension handles, and portable He tank refill kits.

**Note that the certified values of each standard are those provided by the supplier(s) of the individual reference materials. Neither Thermo Fisher Scientific nor its subsidiaries make any guarantee, expressed or implied, as to the accuracy of the certification data of the materials used in this configuration.*



PMI for critical applications.

NITON XL3 900 Series – Filling the Void

Thermo Scientific NITON XL3 900 Series analyzers provide inspectors and scrap metal sorters with the confidence they need for measuring light element alloy content. . . filling the void that once existed for handheld XRF technology. Operators have never had a faster, more versatile, accurate, or productive testing tool.

The best-selling handheld XRF instruments for almost a decade, NITON analyzers continue to set new benchmarks for the industry. The result is maximum productivity, minimum downtime, and expert training and support when you need it, anywhere in the world.

Thermo Scientific NITON XL3t analyzers are just one of our handheld NITON analyzer solutions, which include XRF tools for metal alloy identification, lead-based paint testing, RCRA metals in soil, toy and consumer goods screening, RoHS and WEEE compliance screening, and many other analysis needs.

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NITON XL3t 900 Specifications

| | |
|-------------------------------------|--|
| Weight | < 3.0 lbs (< 1.3 kg) |
| Dimensions | 9.60 x 9.05 x 3.75 in. (244 x 230 x 95.5 mm) |
| Tube | Ag anode 50 kV maximum, 40 µA maximum |
| Detector | High-performance semiconductor |
| System Electronics | 533 MHz ARM 11 CPU 300 MHz dedicated DSP 80 MHz ASICS DSP for signal processing 4096 channel MCA 32Mb internal system memory/ 128Mb internal user storage |
| Batteries | Two rechargeable lithium-ion battery packs |
| Display | Adjustable angle VIP color touch-screen display |
| Standard Analytical Range | >25 elements from S to U |
| Light Element Range | Additional elements Mg, Al, Si, and P via helium purge |
| He Purge for Light Element Analysis | 50 - 75 cc/min helium flow – Fixed-flow regulator Portable aluminum cylinder – 1.5 lbs |
| Data Storage | Internal >10,000 readings with spectra |
| Data Transfer | USB, Bluetooth and RS-232 serial communication |
| Security | Password-protected user security |
| Mode (Varies by Application) | Alloy Modes: Metal Alloy, Electronics, Precious Metals Bulk Modes: Mining, Soil Plastic Modes: RoHS, Toy & Consumer Goods Plastics Other Modes: Lead Paint, Thin Sample Custom Modes: Upon request (based on feasibility) |
| Data Entry | Touch-screen keyboard User-programmable pick lists Optional wireless remote barcode reader |
| Standard Accessories | Locking shielded carrying case RFID reader/encoder Shielded belt holster Spare battery pack 110/220 VAC battery charger/ AC adaptor Portable He regulator, refillable cylinder, and shoulder holster PC connection cables (USB and RS-232) NITON Data Transfer (NDT) PC software Safety lanyard Check samples/standards |
| Optional Features and Accessories | Portable test stand, stationary test stand Extension pole with tripod stand Welding mask HotFoot™ hot surface adapter Soil testing guard Internal CCD sample imaging system Variable spot size aperture |
| Licensing/Registration | Varies by region. Contact your local distributor. |
| Compliance | CE, RoHS |

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