

# At Line Coating Thickness and Plating Bath Analysis Using Handheld XRF

*Thermo Scientific Niton XL3t XRF Analyzers*



## Introduction and Overview

Skyrocketing costs of metal coating materials such as zinc have driven the need for improved process control. Anything other than the optimum coating thickness is unacceptable either from a quality control or cost control standpoint. The time has come for a fast, nondestructive, and accurate method of measuring coating thickness and coating weight, and analyzing plating bath solution. Handheld x-ray fluorescence (XRF) offers general metal finishers and others the advantage of at line testing, eliminating the need to cut samples and spend valuable time taking the sample to a benchtop analyzer to wait for results.

## Continuing a Tradition

Years of development and attention to customer needs have made Thermo Scientific Niton alloy analyzers the first choice in XRF technology, bringing lab-quality elemental analysis wherever it is needed in a field-hardened package. Now, in addition to superior positive grade identification and composition analysis of alloy/metal coatings and substrates, the Niton® XL3t offers the benefit of our coating thickness/coating weight measurement technology – providing an “out-of-the-box” nondestructive solution for gauging the effectiveness of coating and plating systems.

Fast and easy-to-use, the Niton XL3t 800 not only performs at line and plating bath solution analysis, but provides more accurate measurements than non-XRF technologies such as eddy current, magnetic induction, and Beta backscatter. You get precise, nondestructive multilayer coating thickness results in seconds. Testing at the plating line both increases productivity and improves process efficiency – no more over-coating or under-coating. What’s more, the Niton XL3t is your answer to measuring large or irregularly shaped samples, as well as small-diameter wiring or tubing. Cutting samples for benchtop analysis are a thing of the past.

## Seeing Beyond the Surface

From general metal finishers concerned with corrosion resistance and wear resistance, to the automotive industry and its needs for passivation coating analysis, to aerospace with the added concerns of corrosion resistance at high temperatures and lubricity, the Niton XL3t has the appropriate application.

Typical applications are:

- Galvanized zinc over steel
- Zinc or zinc alloy over steel
- Hard chrome over steel
- Electroless nickel over steel
- Chrome/nickel/copper over steel, Zamak™ or plastic
- DACROMET® coating over steel

## Rock-Solid Analysis, Grade Identification, and Coating Thickness Measurement

One of the keys to success of Thermo Scientific Niton analyzers in alloy analysis has long been the instruments’ fast, stable, accurate, and precise fundamental parameters (FP) based factory calibration. The Niton XL3’s proprietary FP analysis algorithm includes nearly every element of interest in virtually

### Niton XL3t Benefits At-a-Glance

- At line analysis – improved process efficiency and productivity
- Totally nondestructive – sample stays intact on the line; no sample cutting
- Accurate data – prevents over-coating, under-coating
- Improved precision & composition analysis – identifies non-homogeneous coatings
- Ease of use – simple to operate, even for nontechnical users
- Fast, simple reporting and certificate generation

Markets	Auto / Construction / Fasteners	Auto / Plumbing / Architectural	Cutting Tools	Aerospace
<b>Coatings Purpose</b>	<ul style="list-style-type: none"> <li>Corrosion resistance</li> <li>Wear resistance</li> <li>Passivation coating</li> </ul>	<ul style="list-style-type: none"> <li>Decorative</li> <li>Corrosion resistance</li> </ul>	<ul style="list-style-type: none"> <li>Corrosion resistance at high temperature</li> <li>Wear resistance</li> </ul>	<ul style="list-style-type: none"> <li>Corrosion resistance at high temperature</li> <li>Wear resistance</li> <li>Lubricity</li> </ul>
<b>Major Applications</b>	<ul style="list-style-type: none"> <li>Zn / Steel, SS</li> <li>Zn alloy / Steel, SS</li> <li>Ni(P) / Steel or Plastic</li> <li>Hard Cr / Steel</li> <li>Organometallic / Zn / Steel</li> <li>DACROMET® / Steel</li> </ul>	<ul style="list-style-type: none"> <li>Cr / Ni / Cu over Plastic</li> <li>Cr / Ni / Cu alloys</li> <li>Cr / Ni / Cu / Steel or Zamak™</li> <li>Ni only / substrate</li> <li>SnCo / Steel</li> <li>Au / Ni / Cu alloys</li> </ul>	<ul style="list-style-type: none"> <li>W-carbide / Tool steel</li> <li>Ti-carbide / Tool steel</li> <li>Ti-nitride / Tool steel</li> <li>Cobalt leaching</li> </ul>	<ul style="list-style-type: none"> <li>Cd / Al</li> <li>Ni / Cu / Al</li> <li>Mo / Ti</li> <li>Cu / Al</li> </ul>

Thermo Scientific Niton XRF analyzers provide the optimum testing solution for all major metal finishing applications.

all types of metal alloys for grade identification and composition analysis. Now, it provides a fast, easy means for testing coating thickness/coating weight and plating bath solution as well, without the requirement for special empirical calibrations.

Yet, providing accurate alloy chemistry is only part of the equation. Using our extensive experience with the metals industry, we have incorporated an alloy grade library that simultaneously provides users with the common trade name of the alloy on the instrument display. By incorporating a hybrid approach, which combines the SAE Unified Numbering System (UNS) alloy grade specifications with knowledge of the “as produced” chemistries of these alloys, Niton XL3 series analyzers provide unmatched accuracy in grade identification.

### Simply Superior Alloy Analysis

We continue to lead the handheld alloy analysis field with technology that responds directly to the needs and requests of the metal production, general metal finishing, and fabrication industries. The Thermo Scientific Niton XL3t 800 Series offers the latest in a series of rugged, dependable tools with improved ergonomics, speed, and performance, while retaining the point-and-shoot simplicity that has been a hallmark of our analyzers.

By combining advanced electronics and materials technology with the most powerful x-ray tubes ever used in handheld XRF instruments, the Niton XL3t is in a class by itself. With multiple primary filters for optimal sample excitation and a helium-purge option to target light elements from magnesium (12) to sulfur (16), this analyzer provides the greatest analytical range, speed, and precision of any handheld XRF instrument.

The Niton XL3 Series features 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.

From the integrated tilting color touch-screen display to the customizable menus for ease of use, our Niton XL3 Series analyzers are 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. What’s more, all Thermo Scientific Niton analyzers use third-generation lithium-ion batteries, providing the longest usage cycle of any handheld XRF analyzer.

### Service and Support

Our Niton XL3 Series instruments have been designed to be the most dependable handheld XRF analyzers ever made. From the rugged Lexan® EXL housing to the precision semiconductor x-ray detector, each individual component has been engineered to be dependable as well as easily serviceable. When routine service is required, we have more than 30 Niton Analyzers service centers on six continents.

### Configurations and Accessories

Providing the right XRF analysis tool for almost any organization’s analytical and budgetary requirements, Thermo Scientific Niton analyzers offer a wide range of options in models and accessories.

All of our XRF analyzers come with a shielded, waterproof carrying case, shielded belt 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, hot surface adaptors, and extension handles, as well as an integrated color CCD camera, which allows you to view the specific measurement areas and store the image together with your analysis data.

### Thermo Scientific Niton XL3t Analyzers – Through Thick and Thin

When it comes to coating thickness, consistency is key. Today, the Niton XL3t 800 brings its established tradition of speed, simplicity, and quality to the plating line.

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Specifications, terms and pricing are subject to change. Not all products are available in all countries. Please consult your local sales representative for details.

All competitive references are based on an internal direct comparison of commercially available handheld XRF analyzers, July 2007.

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**Table 1. Coating Infinite Thickness**

Element	Substrate	Microns
Au	Cu	10
Cd	Al	75
Cd	Fe	75
Co	Fe	50
Co	Ti	50
Cr	Fe	15
Cu	Fe	20
Mo	Fe	50
Mo	Ti	50
Ni	Fe	20
Pt	Cu	15
Sn	Fe	100
Ti	Fe	50
Zn	Fe	50
Zr	Al	70

