

RoHS Compliance and Halogen-free Screening with the Handheld Thermo Scientific Niton XL3t Series XRF Analyzer

Meeting the Commitment to a Clean Environment



RoHS Compliance Screening

The European Union's Restriction of Hazardous Substances (RoHS) Directive (2002/95/EC), aimed at limiting pollution caused by electrical and electronic equipment, prohibits manufacturers from using materials, parts, and subassemblies that contain more than 1000 ppm each of mercury (Hg), lead (Pb), hexavalent chromium (CrVI), polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE), or more than 100 ppm of cadmium (Cd). Since the regulations took effect on July 1, 2006, manufacturers in many countries have sought a cost-effective analytical sample testing solution that will ensure the materials they use are RoHS compliant.

Similar regulations have been or are being promulgated in many countries outside of the EU. China's "Administrative Measure on the Control of Pollution Caused by Electronic Information Products" legislation, or "China RoHS," has a broader scope and provides fewer exemptions than the EU's regulations. As of March 1, 2007, all products sold in China or imported into China must meet new product labeling requirements detailed in the first phase of the directive. California's Proposition 65, which took effect on January 1, 2007, and is similar in restrictions and scope to the EU Directive, sets the stage for an ever-expanding trend toward laws promoting "green" manufacturing.

Halogens Under Review

As a corollary to RoHS, electronic manufacturers and suppliers are paying greater attention to reducing halides in consumer electronics and other consumer goods, such as furniture. As a result, there is an industry-sponsored effort underway to provide

halogen-free flame retardant products. The health and environmental risks of halogenated products concern the production of dioxins and furans that form as an unwanted byproduct of combustion. These potentially environment-damaging substances can come from natural sources like forest fires or man-made sources like power plants. The transition to reduced halogen content in consumer products consequently will decrease the amount of material that may undergo improper incineration, helping to moderate the formation of dioxins and furans.

Halogens are the elements found in Group 17 of the Periodic Table of Elements. Consumer goods manufacturers typically are concerned with the elements chlorine (Cl) and bromine (Br). Br is commonly introduced into a product as a brominated flame

Niton XL3t Benefits At-a-Glance

- **Portable** – Screening can occur on-site, in the lab, on the dock, or in the warehouse.
- **Easy to use** – Any shift personnel can learn to perform the test in a matter of minutes.
- **Fast** – Quantification of restricted substances occurs within a matter of seconds for timely pass/fail determination.
- **Non-invasive** – The analyzed product is not defaced or affected in any way, allowing for subsequent lab analysis.
- **Thermo Scientific GOLDD Technology** – High count rate for lower detection limits and faster analysis times; light element detection (Mg, Al, Si, P, S) without helium or vacuum purging.

retardant (BFR), which became a concern in the early 1990s when the connection was drawn between BFRs and the halogenated dioxins and furans. Some forms of BFRs, namely PBBs and PBDEs, have already been banned under RoHS regulations.

The accepted definition of halogen free¹ is:

- 900 ppm maximum Cl
- 900 ppm maximum Br
- 1,500 ppm maximum total halogens

The Thermo Scientific Niton Solution

Thermo Scientific Niton XL3t Series x-ray fluorescence (XRF) analyzers are the fast, accurate, easy-to-use analytical tools that you need for screening and analysis of plastics, metals, and electronics equipment for substances prohibited under the RoHS Directive and similar legislation or as part of a halogen-free initiative. With a high-power 50 kilovolt, 2-watt x-ray tube, these instruments provide the quickest solder alloy grade identification and laboratory-quality composition analysis of plastics and polymers ever performed with a handheld XRF analyzer.

What's more, Thermo Scientific Niton XL3t Series analyzers now bring the latest in its series of cutting-edge, rugged, dependable tools...the Niton[®] XL3t Series with geometrically optimized large area drift detector (GOLDD™) technology. It delivers improvements in light element detection, overall sensitivity, and measurement times – as much as 10 times faster than conventional Si-PIN detectors, and up to 3 times more precise than conventional smaller, silicon drift detectors.

The Niton XL3t 700 GOLDD is the ideal tool for screening toys, electronics, and consumer goods for



Here, the Cl+Br readings are over their respective thresholds, resulting in a "Fail."

prohibited substances – quantification of total Pb, Cd, Hg, Cr, and Br within a matter of seconds.

Together, these unique instruments provide you with unmatched features and benefits:

- Fast, reliable, nondestructive halogen-free screening with Niton XL3t 700 in less than 30 seconds – reduces costs, eliminates production delays
- Halogen-free screening with Niton XL3t GOLDD in less than 10 seconds – allows a greater number of samples to be tested in a shorter period of time

Niton XL3t 700 Series Limits of Detection for Restricted Elements in Polymers All values below are represented in ppm (mg/kg)				
Element	PE blank	PE+2%Sb	PE+5%Br	PVC
Ba	120	220	240	N/A
Sb	25	N/A	65	30
Cd	15	25	35	15
Pb	4	10	50	10
Br	3	5	N/A	10
Se	3	5	40	15
As	3	10	20	10
Hg	6	15	30	20
Cr	20	20	25	40
Cl	200	250	350	N/A
Cl*	120	140	160	N/A

Niton XL3t 700 Series for restricted elements in polymers using the 8 mm aperture; 180-second total analysis time, 120 seconds for the main filter and 60 seconds for the low filter.

* Lower chlorine detection limits achieved utilizing optional Cl calibration on light filter. These detection limits achieved in 60 seconds on light filter instead of low filter.

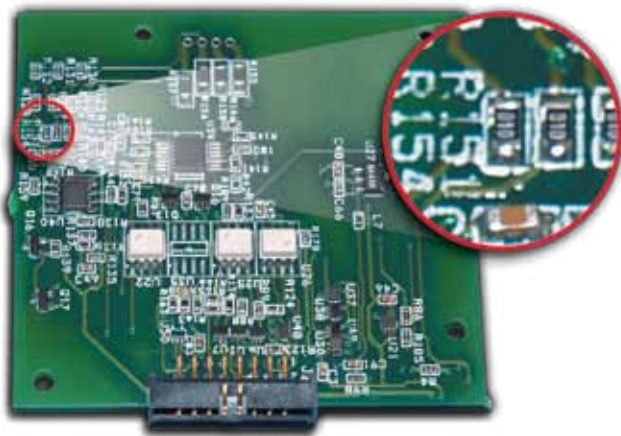
Niton XL3t 700 GOLDD Limits of Detection for Restricted Elements in Polymers All values below are represented in ppm (mg/kg)				
TIME	PE blank	PE+2%Sb	PE+5%Br	PVC
Element	30 Sec/filter	30 Sec/filter	30 Sec/filter	30 Sec/filter
Ba	110	200	200	N/A
Sb	25	N/A	50	25
Cd	12	16	30	12
Pb	3	8	45	15
Br	3	5	N/A	8
Se	3	12	30	12
As	3	8	15	15
Hg	4	10	22	25
Cr	12	20	15	30
Cl	50	60	50	N/A

Niton XL3t 700 Series with GOLDD technology for restricted elements in polymers using the 8 mm aperture; 90-second total analysis time.

- Integrated, color CCD camera – visually identify, locate, specify, and save the image of the analysis area together with elemental analysis results
- Small-spot capability – isolate and analyze individual parts of heterogeneous material more easily
- Bluetooth™ and USB communications – direct data file transfer to a PC or networked storage device
- Unique thickness algorithm – accurately test polymer samples only 0.1 mm thick
- No special calibrations or other user input

Even high levels of fire retardants, such as bromine and antimony, present no analytical difficulty for the Niton XL3t. All data, including pass/fail results, element concentrations, qualitative sample information, and XRF spectra (from P through uranium (U)), are encrypted and saved in memory for traceability and archiving.²

Whether you choose the Niton XL3t 700 or Niton XL3t 700 GOLDD, you get complete portability that allows you to test objects on-site, e.g., warehouses. If desired, or if the sample type requires, you also can use the instrument as a benchtop analyzer by utilizing one of the test stands developed specifically for the Niton XL3t 700 Series.



Small-spot feature allows better location, isolation, and measurement of small components; use in conjunction with CCD camera and sample imaging system.

Analysis of Small Parts and Solder Joints on Heterogeneous Samples

Rapid nondestructive analysis of small electronic components on heterogeneous samples, like populated circuit boards, is challenging for any size analytical instrument: individual components are small and mounted close together, making them difficult to analyze, and are themselves typically heterogeneous in composition. Thermo Scientific Niton XL3t 700 Series analyzers meet and even exceed the challenge.

Adding significant analysis capability is our exclusive option of a variable analysis small-spot feature, which allows you to collimate the x-ray beam on individual areas as small as 3 mm. The small-spot analysis feature lets you switch “on the fly” between normal test mode



Users can set limits for pass/fail thresholds. For example, Br+Cl is set to 1500 +/- 200 ppm in plastics mode.

(8 mm) for analyzing larger, homogeneous materials, and small-spot mode for locating, isolating, and measuring individual small components, such as leads or terminations on a populated PCB.

Further, an optional, color CCD camera and sample imaging system, the first CCD camera ever integrated into a handheld XRF analyzer, allows users to visually identify, locate, specify, and save the image of the analysis area together with elemental analysis results.

The small-spot focus feature, combined with the CCD camera, is ideal for positioning, analyzing, and documenting the analytical results of small components – something previously only achievable with benchtop XRF analyzers. The CCD camera displays a picture image of the sample on the instrument screen, which is stored along with the analysis data for easy reference, data management, and data integrity.



Screen toys, electronics, and consumer goods for prohibited substances with Niton XL3t Series XRF analyzers.



More than 30 service and supports centers are located worldwide.

Service and Support

Thermo Scientific Niton XL3t Series analyzers have been designed to be the most durable and dependable portable analyzers ever made. From the rugged housing to our precision detectors, each individual component has been engineered to be dependable as well as easily serviceable. When routine service is required, you'll find it convenient with more than 30 best-in-class factory-trained service centers located across six continents.

Conclusion

Thermo Scientific Niton XL3t 700 Series and now the Niton XL3t 700 GOLDD analyzers provide you with a real solution to the problem of screening of plastics, metals, and electronics for compliance with RoHS regulations and halogen-free initiatives, making our analyzers a core element of many comprehensive compliance plans. Our handheld analyzers are ideal screening tools from inspection of incoming materials to the analysis of finished products. Portable XRF analysis gives real-time results, making it possible for you to quickly verify or refute the validity of supplier certifications. Because the testing is nondestructive, when necessary, selected samples can be subsequently analyzed using traditional destructive lab techniques. Increased testing permits you to "trust but verify," translating into better compliance at lower cost than other available methods.

In addition to these offices, Thermo Fisher Scientific maintains a network of representative organizations throughout the world.

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