

# RoHS: Screening and Analysis of Electrical Instruments and Components



*XRF and ICP-OES spectrometers for the determination of regulated substances in electrical and electronic products according to the European Directive RoHS*

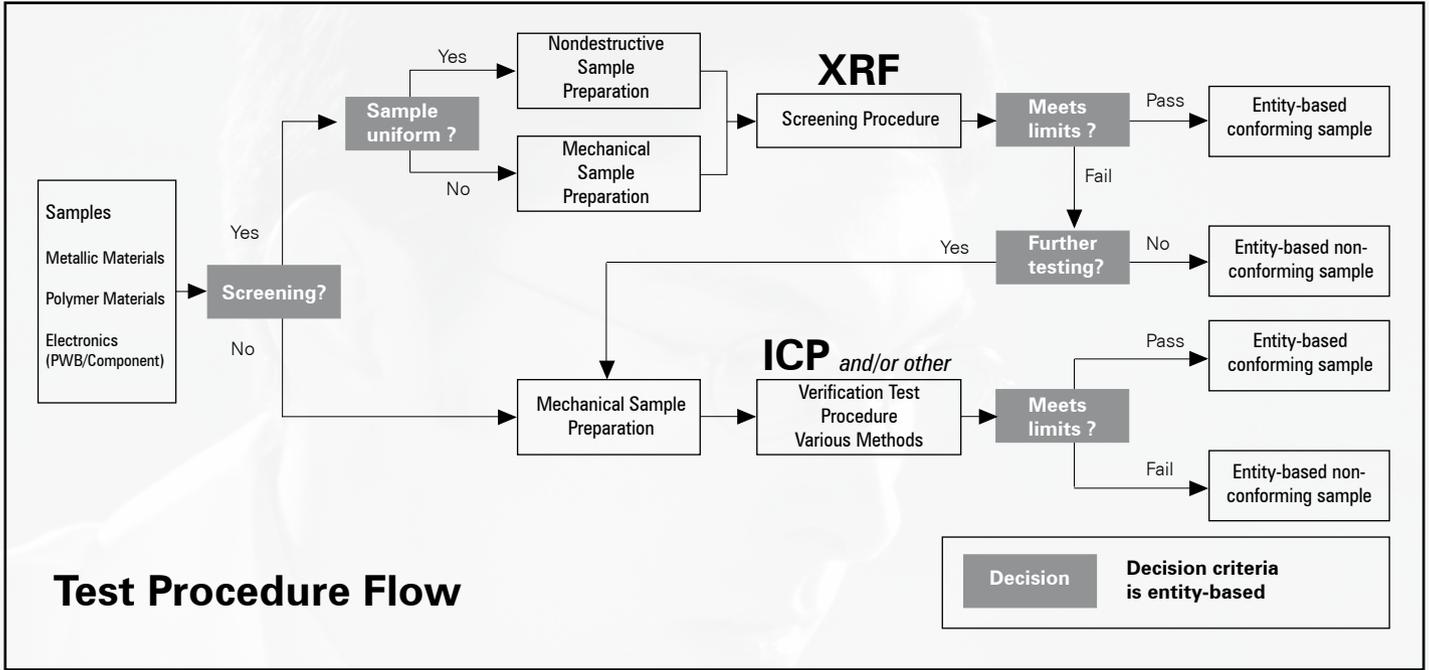
Since July 2006, electrical and electronic instruments and components marketed in the European Union are forbidden to contain the hazardous metals cadmium, lead and mercury. This has been established in the European directive for the Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) that also forbids the use of hexavalent chromium and the brominated flame retardents containing PBB and PBDE. The tolerance limits are 100 mg/kg for cadmium and 1000 mg/kg each for the other elements and bonds. The WEEE directive simultaneously regulates the minimum quotas for the recycling and reuse of electrical and electronic waste, for which products containing low levels of harmful substances are an important prerequisite.

If manufacturers and suppliers want to prove their conformity with the directives, functional analytical procedures are urgently required. X-ray fluorescence analysis and optical emission spectrometry with ICP, along with other technologies, are recommended in the IEC 62321 from the International Electrotechnical Commission.

The scope of the RoHS directive includes, for example:

- Small and large household appliances
- IT and telecommunications equipment
- Consumer equipment
- Lighting equipment
- Electrical and electronic tools (with the exception of large-scale stationary industrial tools)
- Toys, leisure and sports equipment
- Automatic dispensers

**With the SPECTRO xSORT, SPECTRO XEPOS and SPECTRO MIDEX X-ray fluorescence spectrometers and the SPECTRO ARCOS and SPECTRO GENESIS ICP-OES spectrometers, SPECTRO offers efficient solutions for the analytical requirements for the determination of regulated substances in electrical and electronic equipment. The total amount of chromium and bromine together with the elements cadmium, mercury and lead can be very exactly determined with these instruments. If the tolerance values for the former are exceeded, the exact fraction of hexavalent chromium or PBB and PBDE can be determined with different analytical techniques.**



Instrument	Analytical Method	Analysis Type	Typical LOD range
SPECTRO xSORT	portable XRF	Screening	mg/kg
SPECTRO MIDEX	XRF	Screening Linescan Mapping	mg/kg
SPECTRO XEPOS	ED(P)-XRF	Screening	mg/kg
SPECTRO ARCOS	ICP-OES	Analysis	≤ μg/kg
SPECTRO GENESIS	ICP-OES	Analysis	≤ μg/kg

In the IEC 62321 with recommendations for suitable analytical procedures within the framework of the RoHS directive, the International Electrotechnical Commission describes X-ray fluorescence analysis, with its minimal requirements for sample preparation, as being suited for fast quantitative screening.

ICP emission spectrometry, with its more complex but standardized sample preparation procedures, is indicated as being an appropriate tool for quantitative elemental analysis.

# SPECTRO XEPOS and SPECTRO xSORT

The SPECTRO xSORT is a particularly powerful portable ED-XRF analyzer with exceptional capabilities. Compared to conventional handheld XRF instruments, it allows for decidedly shorter measurement times. Sample to be analyzed can be anything from polymers and plastics to metal alloys.

For high volume testing, for tiny or thin parts the instrument is mounted into the portable docking station.



## SPECTRO xSORT

- Handheld ED-XRF instrument
- Short screening times
- Matrix coverage from polymers to metal alloys
- Software corrects for influences from matrix and thickness

Compared to conventional benchtop instruments, the SPECTRO XEPOS achieves decidedly better detection limits. A very low powered X-ray tube with a power of only 50 W serves as the radiation source. The extreme sensitivity is obtained with an extended polarization system by which the primary tube radiation is bundled in a luminously intense polarization and secondary target optics. With this technique, it is not necessary to utilize radiation filters that lead to heavy losses in sensitivity.

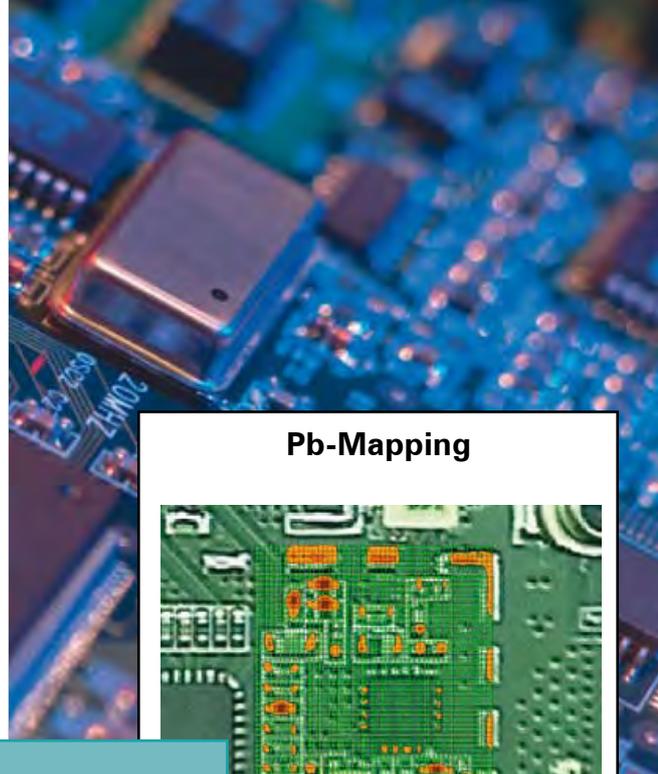
With its versatility and flexibility, the SPECTRO XEPOS is supremely suited to limiting value determination in accordance with the regulations. Solid, powder and liquid samples can be analyzed. The analyses can be easily automated using an integrated autosampler. The instrument analyzes largely matrix independent as the software corrects for this type of influence as well as for those due to sample thickness. This and many additional instrument and software characteristics make operation simple and safe.

## SPECTRO XEPOS

- Elemental range Na - U
- Low detection limits due to polarization excitation
- Analysis of solids, powders and liquids
- Integrated autosampler
- Software corrects for influences from matrix and thickness



*X-ray fluorescence spectrometry is more suited to fast screening for the elements cadmium, mercury, lead, chromium and bromine than any other analytical method. It requires little or no sample preparation and is non-destructive. Even samples of polymer granulates, insulation and housing materials can be directly analyzed if necessary.*



**Pb-Mapping**



### **SPECTRO MIDEX**

- Small Spot Analysis with 1 mm spot at the sample, optionally adjustable in steps from 0.2 to 4 mm
- Elemental range Mg - U
- ROHS compliance screening method for a wide range of matrices
- FP+ Application for the analysis of completely unknown samples
- Linescan and mapping

The SPECTRO MIDEX is used for the analysis of very small surfaces and samples. It is a multifaceted X-ray fluorescence micro-analysis spectrometer with focal point excitation and a high resolution detection system that is also capable of conducting quick screening analyses. All important elements of interest can be determined within less than 180 s.

The SPECTRO MIDEX is equipped with a roomy sample chamber. The spot size is only 1 mm, as an option can be adjusted in steps from 0.2 to 4 mm. The optional motor driven xyz-table allows mapping of sample surfaces up to double EK format (233x160 mm). A fast mapping of a double EK board can be done within less than 30 minutes. "Hot spots" can be analyzed in a second step to obtain quantitative results.

# **SPECTRO MIDEX**



*SPECTRO supplies the SPECTRO ARCOS ICP-OES spectrometer as an upscale analytical instrument with extreme exactness for a wide range of wavelengths. Because of its higher cost and, compared to XRF, more complicated sample preparation, it is usually used for control measurements on samples that could not be clearly judged with XRF. To do this, the SPECTRO ARCOS utilizes superior technology.*



### **SPECTRO ARCOS**

- Extended spectral range from 130-770 nm for perfect line selection
- Low-maintenance UV system with minimal operating cost
- Complete analysis of more than 10,000 emission lines in 2 seconds
- Unique optical system with excellent resolution
- Comprehensive accessory options for fully automated analysis

With its unique, analytically superior optical system and the UV-PLUS concept for highest performance in the UV range, the SPECTRO ARCOS captures the entire relevant spectrum from 130 to 770 nm simultaneously. The new high-speed read-out system is not only the basis for quick measurement and evaluation, but also permits the detectors a dynamic operating range of new dimensions. The free-running, robust 27.12-MHz generator enables stable excitation conditions even under extreme loading, and requires no external water cooling.

The SMART ANALYZER VISION software platform is easy and intuitive to operate. It offers a wide range of functions, which perfectly support the innovative instrument design and make it simple to use. A special strength lies in the deliberate automation module, which can easily realize both standard tasks and also very complex analytical requirements.

# **SPECTRO ARCOS**





*The SPECTRO GENESIS is the first and only ICP-OES spectrometer available with factory methods - truly "plug & analyze" without needing to first develop a method. The methods are delivered ready for use straight out of the box with an application package that includes the sample introduction system, sample preparation instructions and method documentation.*

The SPECTRO GENESIS offers a real economic alternative to sequential ICP and Atomic Absorption spectrometers, enabling those who are unfamiliar with ICP to profit from the advantages of leading CCD ICP technology and to use a powerful, low cost and user friendly analytical system. An extensive package of accessories is available for the SPECTRO GENESIS to further expand its application range. This includes, but is not limited to, a wide range of sample introduction systems, autosamplers, an autodilutor, an ultrasonic nebulizer and a hydride generator. The SPECTRO GENESIS is equipped with powerful automation functions for the safe unattended analysis of a large number of samples. With an optional autosampler, several hundred samples can be processed without operator intervention. If the relevant methods are available, simply import or define a sample list.

# SPECTRO GENESIS

## SPECTRO GENESIS

- A powerful alternative to conventional sequential ICP-OES and Atomic Absorption spectrometers
- High speed analyses using simultaneous measurement of the complete spectrum
- Compliant factory methods for environmental and industrial applications
- Minimal installation and training requirements
- Compact design enables seamless integration into the laboratory
- Excellent price/performance ratio



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