

XMET8000 Series

X-MET8000 Series for the rapid measurement of ZnNi coatings on steel

BACKGROUND

Zinc-Nickel (ZnNi) is a high performance coating that provides high electrical conductivity and outstanding corrosion resistance, even in the harshest environments. It acts as a sacrificial barrier, preventing corrosion from reaching the base material. It is commonly used in the automotive, aerospace and defence industries on components such as fuel lines, fasteners, coaxial cables, connectors, and for joining steel components with aluminium.

The property of the Zinc-Nickel coating depends on both its thickness and its composition (typically 10-15% Ni and 90-85% Zn).

Controlling the thickness and composition of the coating ensures that plated parts meet their functional requirements, and that operational costs are minimised.

INSTRUMENTATION

X-ray fluorescence (XRF) is an analytical technique that is widely used for the analysis of metal coatings. It provides reliable and rapid analysis (results are available in seconds), is non-destructive (no need to scrap samples after analysis), and it can be used by any operator with minimal training.

While benchtop XRF is commonly used to measure small components, handheld XRF offers truly portable analysis, making it ideal for the testing of large and/or heavy parts at any location.

Hitachi High-Tech's X-MET8000 handheld analyser combines a high performance X-ray tube and a high resolution silicon drift detector (SDD) to deliver the speed and performance needed for the analysis of coatings.

Its ruggedness (IP54 rated) and long battery life (up to 10-12 hours) make it the tool of choice for incoming goods or inventory inspection, and for process and quality control.



CALIBRATION

An empirical calibration was carried out for this application. The calibration included certified reference materials with a large variety of ZnNi compositions and thicknesses to demonstrate the X-MET's wide-ranging applicability.

Each calibration standard was measured for 30 seconds. The calibration performance summary is presented in Table 1. Note: for best accuracy, the calibration range should be representative of the end-user's plating process, thus is likely to be narrower both in composition and thickness.

INSTRUMENT PRECISION AND ACCURACY

In order to demonstrate the X-MET's precision and accuracy for this application, two reference materials (not included in the calibration) were measured ten times each for 30 seconds. The data is presented in Table 2.

ROUTINE ANALYSIS

No sample preparation is required prior to analysis. The user simply places the nose of the analyser on the part to be measured, and presses the trigger to start the analysis. Initial results are displayed on the analyser's large (4.3") integrated touch screen within 2 seconds, and are updated until the end of the measurement. A typical analysis time for ZnNi coating is 10 - 20 seconds.

Coating uniformity over a large component can be verified quickly by taking several readings over the surface of the component, or by sliding the X-MET's nose over the surface of the sample during the analysis.

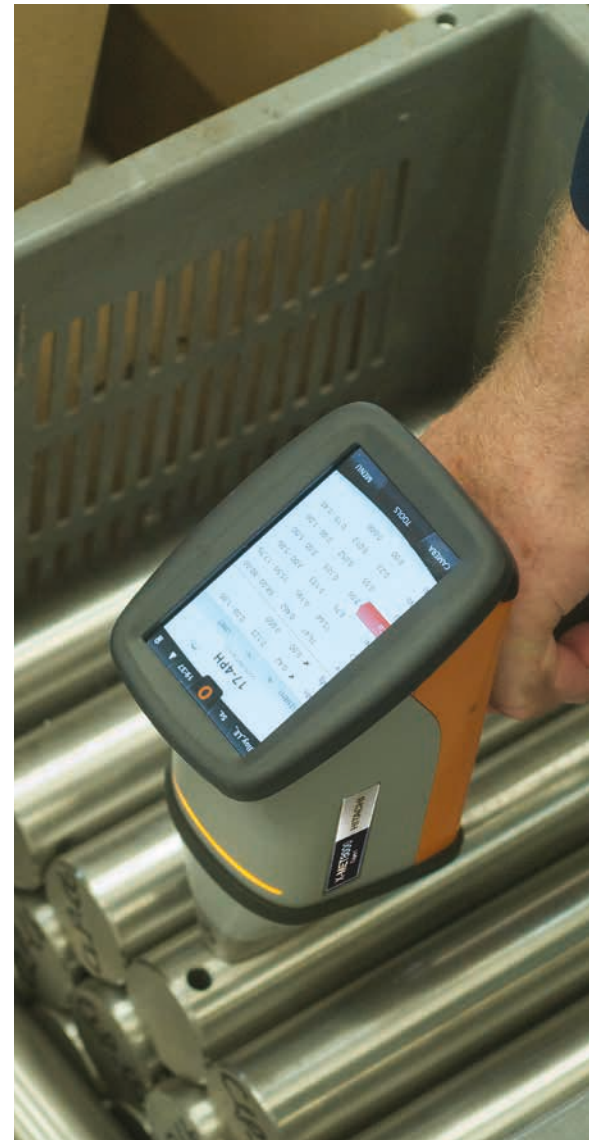
When testing small components, the X-MET8000's small-spot and camera options can be used to accurately position the X-MET's nose on a sample and measure parts down to 3mm in size.

	Ni content in ZnNi coating	ZnNi thickness
Calibration Range	3-18 wt%	2 - 22 μm
Standard error of calibration	1.5 wt%	1.2 μm

Table 1: Calibration performance summary

	Sample 1		Sample 2	
	Ni, wt%	ZnNi, μm	Ni, wt%	ZnNi, μm
Minimum	8.4	9.4	14.9	18.4
Maximum	8.5	9.5	15.0	18.5
Average	8.4	9.4	14.9	18.5
Given	9.0	9.7	15.1	17.5
Precision (95% confidence)	0.08	0.04	0.07	0.05

Table 2: X-MET8000's repeats results for ZnNi over Fe



For total ease of use and maximum productivity, operators may prefer to use the following accessories:

The light stand and safety shield: ideal for the analysis of fasteners and sample cups (for plating solutions analysis). Both options can be stored in the analyser's compact transport case, for maximum flexibility and portability.

The benchtop stand: allows safe testing of parts with awkward shapes. Its use does not require mains power, and it is easily folded to be stored away when not in use.

PLATING SOLUTIONS ANALYSIS

Single or multiple element plating solutions can also be measured with the X-MET8000. Once a calibration is derived, it is simply a question of pouring the solution into a sample cup fitted with a thin film (e.g. Mylar), and measuring it using the light stand and safety shield or the benchtop stand.



Benchtop stand (folded and in use)



X-MET8000 light stand and safety shield

SUMMARY

Once calibrated (a procedure that can be carried out by the user), Hitachi High-Tech's X-MET8000 provides accurate and repeatable results for the measurement of ZnNi coatings over Fe. The X-MET's ease of use and ruggedness make it an ideal tool for use on the shop floor for the incoming inspection of parts or components, as well as for process and quality control. The versatility of the calibration software also enables the analysis of plating solutions (single and multi-element), ensuring the rapid monitoring of the plating baths composition. With results being available on the X-MET's screen in seconds, decisions to accept or reject a part or modify the plating process can be made on the spot, maximising productivity and saving costs.

OUR SERVICE

Our global network of service hubs provides a full range of technical support including: telephone help-desks, on-line diagnostics, rental instruments, recertification and maintenance, training, extended warranties, consumables and accessories and repairs. Our service agreements provide a great way to avoid unplanned costs and ensure your analyser is maintained in excellent condition.



ORDERING INFORMATION

- | X-MET8000 Optimum or Expert. Includes the compact, waterproof, rugged carrying case, a wrist strap and lanyard, 2 batteries, a battery charger, a USB cable to connect to a PC/laptop, 5 replacement windows and user manuals.
- | Empirical calibration software.
- | Samples with known ZnNi coating composition and thickness, for calibration purposes (provided by user).

OPTIONAL

- | Light stand and safety shield, for the analysis of small samples (included in some packages).
- | Benchtop stand, for the safe measurement of awkward shapes.
- | Small-spot collimator and camera, for the analysis of component down to 3mm in size.
- | Sample cups and thin film, for the analysis of plating solutions.

Visit www.hitachi-hightech.com/hha for more information.

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