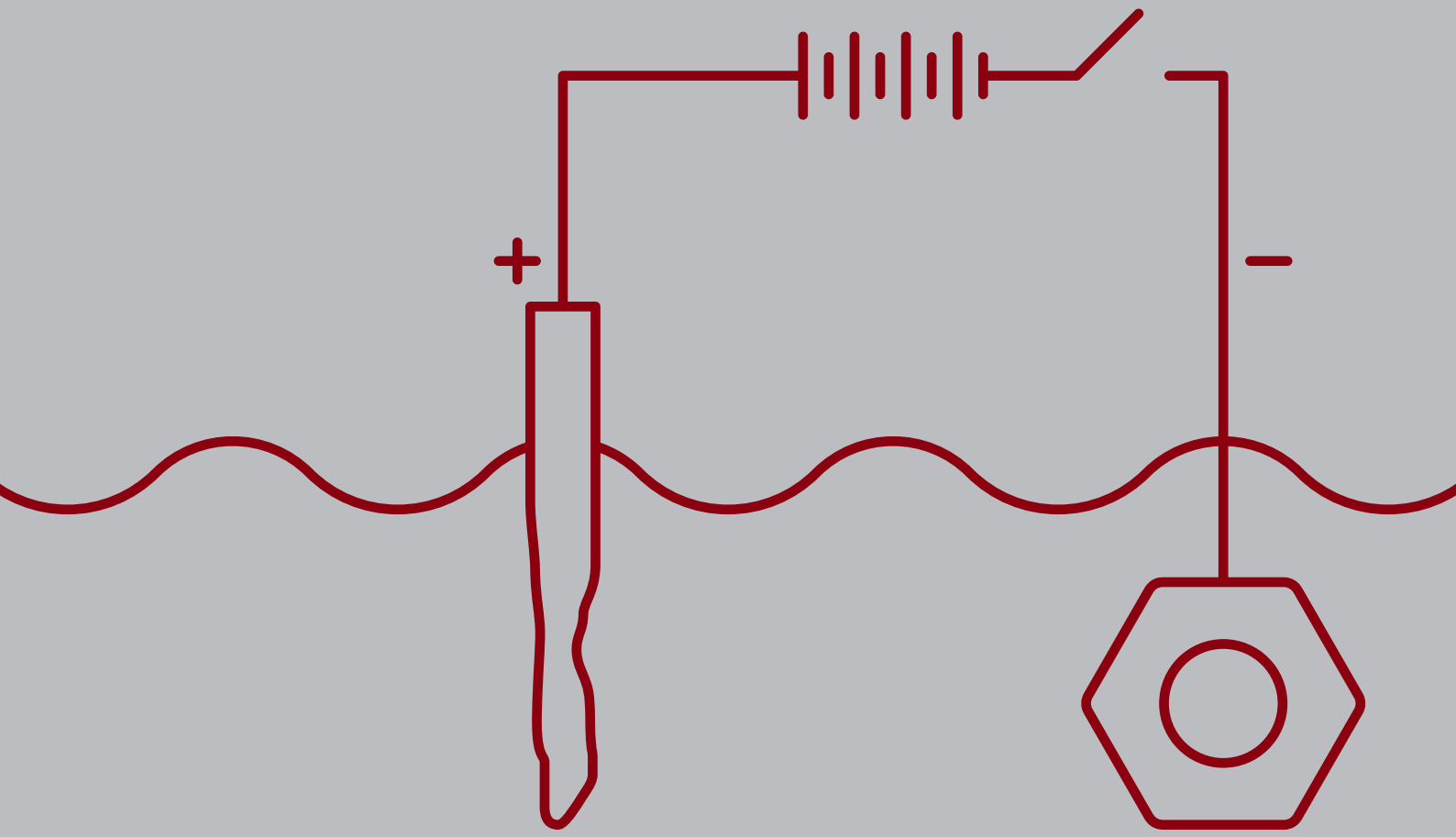
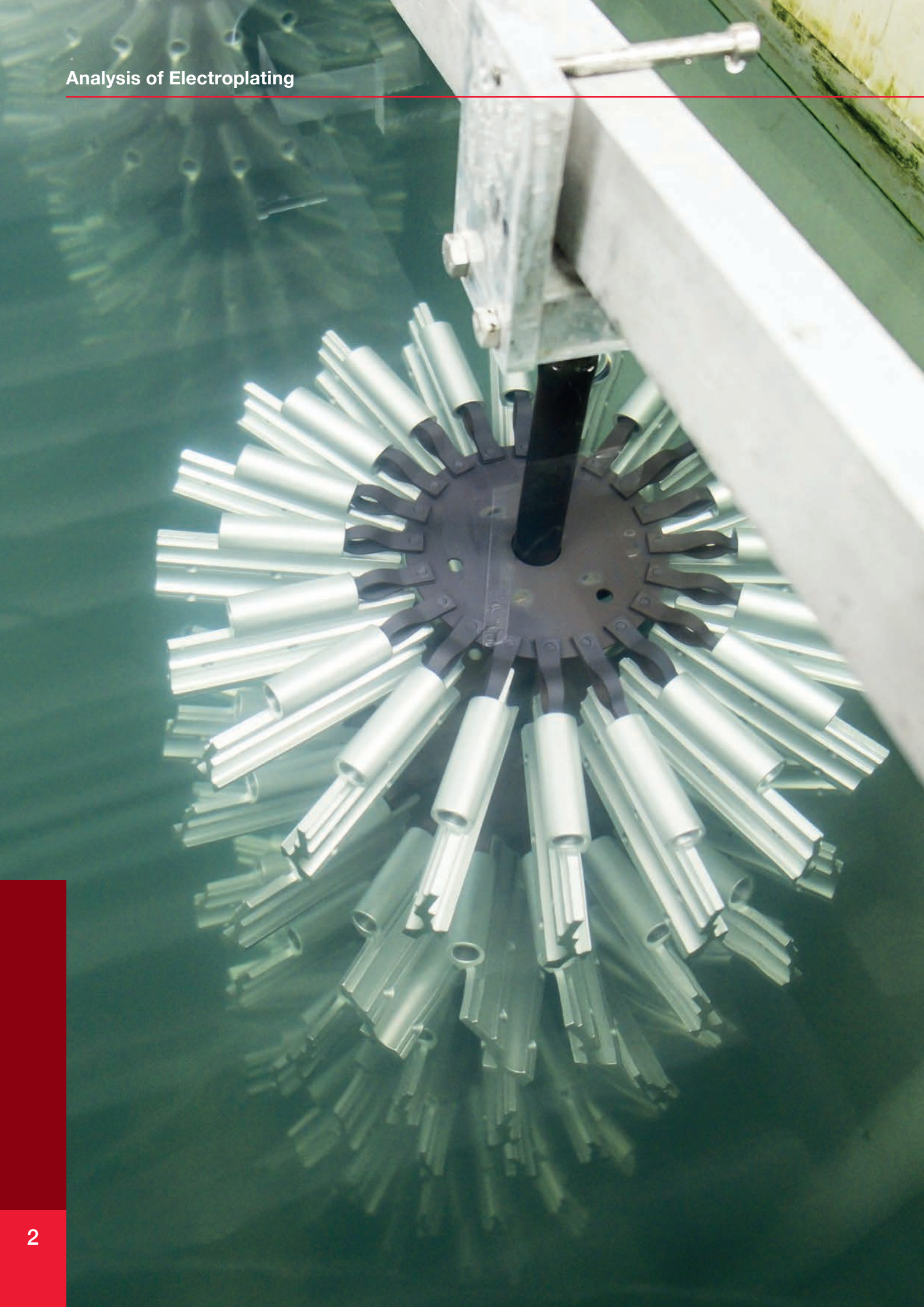
HITACHI
Inspire the Next

Analysis of Electroplating



FT200 SERIES FOR PLATING



Introduction

Metals, plastics, ceramics, and other materials are plated or coated to improve the corrosion resistance, wear resistance, high temperature tolerance, electrical conductivity or aesthetics of individual mechanical components or finished goods.

As the industries supported by electroplaters move toward 100% inspection to ensure products meet their expected lifetime, increased quality control and quality assurance testing of plated parts is anticipated. Improved quality control can also lead to reduced chemical consumption and scrap.

Parts of varying shapes and sizes commonly found in plating shops may pose different analytical challenges. However, all can benefit from simplified sample presentation and better precision to facilitate thousands of XRF measurements each day.

Both the hardware configuration and software features of the XRF analyzer have significant impact on test programs. Having the right equipment in place allows operators to balance how much time will they spend working the production line and how much time they spend taking measurements with the XRF.

Analytical solutions

Hitachi specializes in high-tech solutions designed to help manufacturers maintain quality in a rapidly evolving environment which requires an XRF to be accurate, efficient, and easy to use. This combination allows for high testing volumes and frees up personnel to perform other tasks. Below are some features that can be found in Hitachi's XRF coatings analyzers, purpose built to improve your test program:

Focusing

Focusing is the process of establishing the distance from the X-ray tube to the part to the detector. This is a critical step, because changes to this distance may affect the accuracy and reproducibility of XRF results. Setting the focal distance can be done in several ways.

- **Manual focus:** a laser is shone onto the surface of the part and the operator moves the X-ray tube and detector up and down until the laser is positioning on the focus line. This is effective but can take time and requires the operator to make decisions.
- **Automated focus:** in this method the desired focal distance is selected during calibration setup. When setting up a measurement, the instrument uses a sensor to measure the distance and automatically moves the head into the right position. This is faster than the manual approach and removes operator influence.

The time needed to set up a 6-point program with parts of different heights can be reduced by 33% compared to manual focusing, saving 40 hours per year when running 50 batches per day.

- **Distance independent measurement:** this method doesn't require the analysis head to move. The instrument uses a sensor to measure the distance and updates the instrument's calibration to account for the geometry. This is the fastest method since the operator only needs to position the part under the X-ray tube before starting a measurement.

The time needed to set up a 6-point program with parts of different heights can be reduced by >60% compared to manual focusing, saving 76 hours per year when running 50 batches per day.

Camera view

The XRF has a camera for making fine adjustments to the position of the part being measured. The challenge for operators is first getting close enough to this location – the parts are small, and the chamber is large. In addition to the standard camera, a second wide-view camera can be used to get a view of the entire measurement area, then zoom in and select the feature to be measured. This means operators spend less time searching for the desired area.

The time needed to set up a 5-point program can be reduced by 20% compared to using only the standard narrow-view camera, saving 40 hours per year when running 50 batches per day.

Part and pattern recognition

Machine vision combined with powerful software recognizes parts or individual patterns to expedite measurement setup and increase testing volumes.

- **Find My Part™:** A part is loaded into the instrument, the recognition routine is started, the part is identified, and the instrument does the rest. The entire measurement routine is loaded – measurement locations, collimator sizes, calibrations, analysis time, data export rules and more. Operators do not need to make any decisions, and the setup takes seconds instead of minutes.

Starting a measurement using machine vision can be 72% faster – or quicker – than setting up a measurement manually, reducing the setup time from minutes to seconds

- **Pattern recognition:** The software looks for instances of key features and automatically makes fine adjustments to position the part precisely where needed. This is useful for measuring an area on a connector that is centered across the width and a defined length from the tip, for example, simplifying the task for the operator and ensuring parts are positioned and tested consistently.

Aperture style

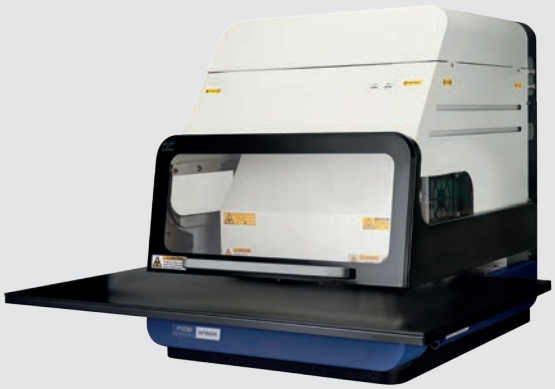
The X-ray beam generated by the XRF needs to fall within the size of the features being measured. If the beam is larger than the feature or part, the results will be inaccurate, as the analyzer will take the composition of the surrounding area into account. There are two main types of apertures that reduce the outlet from the X-ray tube to a usable size:

- **Mechanical collimator:** a metal block that has a hole drilled precisely through it. This stops a portion of the X-ray signal, only allowing a small amount to pass through the hole and reach the sample. Collimators can be round or rectangular and come in a variety of sizes.
- **Polycapillary optics:** a series of specialized glass tubes that collect more of the output from the X-ray tube and focus the output into a very small area – typically < 50 µm, which is smaller than what is possible with collimators. Since more of the tube output is utilized, more X-ray signal reaches the part, enabling an XRF to measure thinner coatings on smaller features with better precision in shorter measurement times.

XRF Coatings Analyzers for Electroplating

Our range of XRF analyzers help to ensure consistent and accurate coatings on mechanical components and assemblies, measuring even the most complex features with a high degree of accuracy and reliability.

FT200 Series



FT200 Series: Advanced features for high-volume testing

Designed to simplify and accelerate testing of components and assemblies, the FT200 series makes it easier to measure more parts in less time. Let your XRF make decisions for you.

The FT200 series offers:

- Find My Part™ smart recognition for quicker start-up times
- Automated sample focusing for increased throughput and ease of use
- Optional second, wide-view camera for easier feature locating
- Flexible connectivity for sending results to SCADA, QMS, MES and ERP systems, and diagnostics to Hitachi
- A choice of proportional counter or a large-area, high-resolution SDD for high precision on thinner and more complex coatings

	FT200 Series
Detector	Proportional counter or SDD
Aperture style	Mechanical collimation
Maximum number of apertures	4
Measure features < 50 µm	n/a
Manual focus (laser)	
Automated focus	
Distance-independent measurement	
Wide-view camera	
Part recognition	

X-Strata920



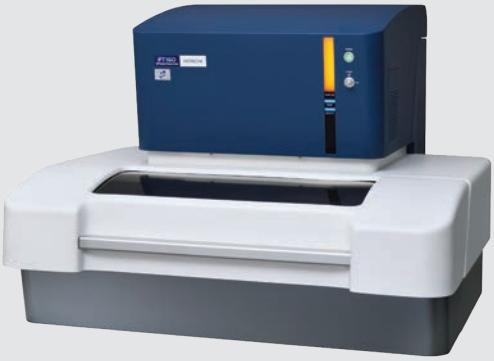
X-Strata920: XRF with your choice of analysis chamber

Designed to analyze samples of a wide variety of shapes and sizes, the X-Strata920 is ideal for many applications.

The X-Strata920 offers:

- A high resolution SDD option for complex coatings analysis
- Four configurations to fit samples of any shape
- A slotted chamber for small or long and skinny samples
- An optional mini-well chamber for taller parts
- An optional automated motorized stage for measuring several locations on a single component

FT160



FT160: Microspot analysis for miniaturized electronics

Designed for microspot and ultra-thin coatings analysis, the FT160's optics and detector technology are optimized for the smallest of features.

The FT160 offers:

- Polycapillary optics and a high sensitivity SDD detector for high precision
- Measurement of features smaller than 50 µm
- Fast results and simplicity of use to support high throughput
- A large door and stage for rapid part setup
- A large sample observation window to enable test viewing

X-Strata920	FT160
Proportional counter or SDD	SDD
Mechanical collimation	Polycapillary optic
6	1
n/a	
n/a	
n/a	n/a
n/a	n/a
n/a	n/a

Performance and results

Typical performance for common, representative applications is shown in the tables below. The precision was calculated from 30 repeat measurements. Precision is influenced by measurement time, collimator size, elements present and thickness range. In some cases, the error can be reduced by optimizing the calibration range for specific applications.

Typical performance for Au/PdNi/Ni/Cu using a circular collimator with a diameter of 0.3 mm (12 mil)

			FT230	FT210
Analyte	**Tested range**	**Standard error**	**Precision (2σ)**	**Precision (2σ)**
Au	0.05 - 1 µm (1.97 - 39 µin)	0.025 µm (1 µin) or 5% relative whichever is greater	0.005 µm @ 0.25 µm (0.20 µin @ 10 µin)	0.006 µm @ 0.25 µm (0.24 µin @ 10 µin)
PdNi	0.05 - 1.5 µm (1.97 - 59 µin)	10% relative	0.011 µm @ 1.02 µm (0.43 µin @ 40 µin)	0.022 µm @ 1.02 µm (0.86 µin @ 40 µin)
Ni	2 - 15 µm (79 - 591 µin)	~15% relative	0.021 µm @ 4.7 µm (0.83 µin @ 185 µin)	0.041 µm @ 4.7 µm (1.61 µin @ 185 µin)

Typical performance for Cr/Ni/Cu/ABS plastic using a circular collimator with a diameter of 0.3 mm (12 mil)

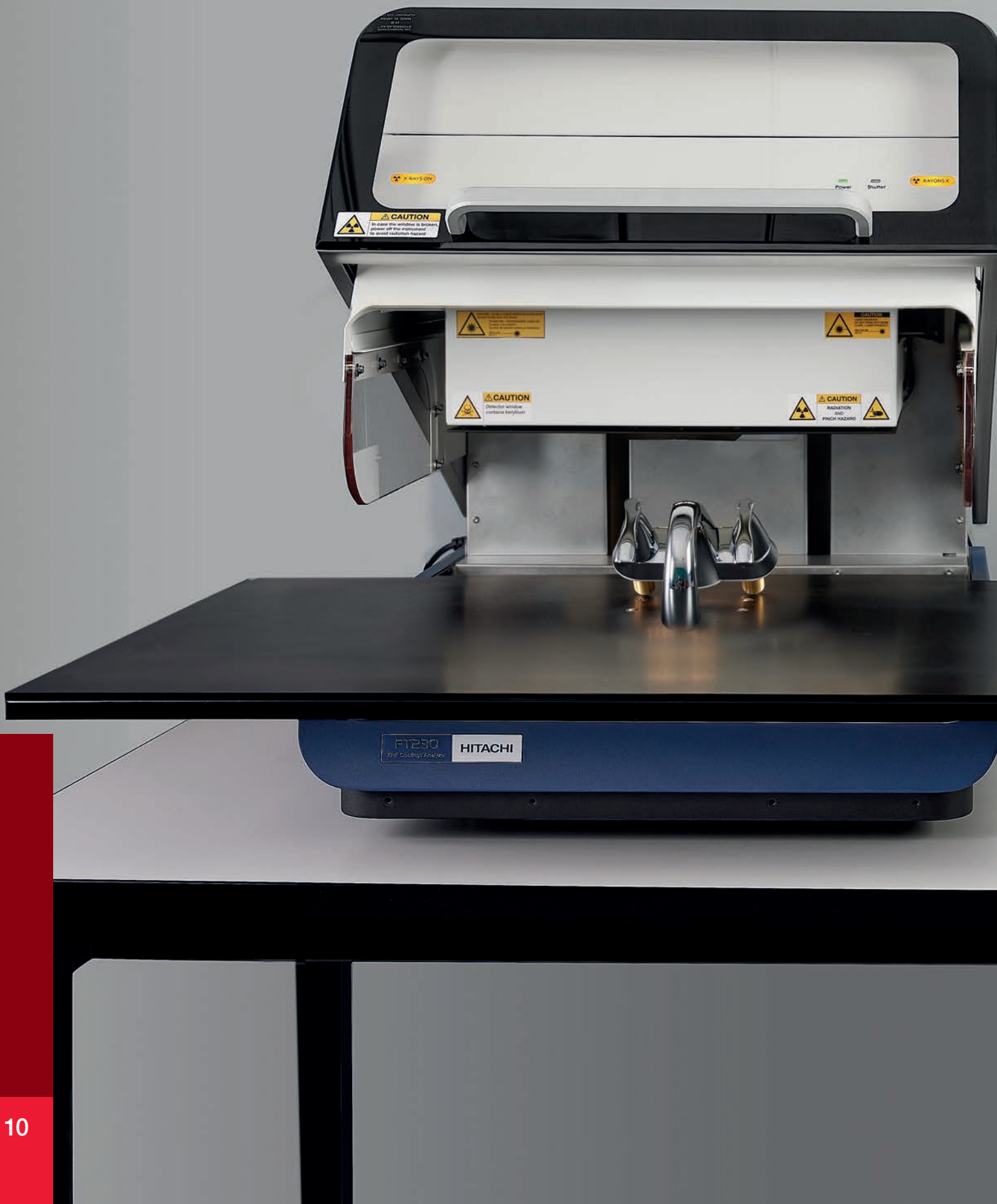
			FT230	FT210
Analyte	**Tested range**	**Standard error**	**Precision (2σ)**	**Precision (2σ)**
Cr	0.25 - 0.99 µm (10 - 39 µin)	0.025 µm (1 µin) or 5% relative whichever is greater	0.014 µm @ 0.99 µm (0.55 µin @ 39 µin)	0.029 µm @ 2.1 µm (1.13 µin @ 83 µin)
Ni	0.97 - 9.5 µm (38 - 374 µin)	10% relative	0.396 µm @ 9.5 µm (16 µin @ 374 µin)	0.124 µm @ 4.7 µm (5 µin @ 185 µin)
Cu	2.3 - 22.3 µm (90 - 879 µin)	~15% relative	1.15 µm @ 12.3 µm (45 µin @ 484 µin)	1.03 µm @ 17.4 µm (41 µin @ 684 µin)

Typical performance for NiP/Fe
using a circular collimator with a diameter of 0.3 mm (12 mil)

			FT230	FT210
Analyte	**Tested range**	**Standard error**	**Precision (2σ)**	**Precision (2σ)**
NiP	0.45 - 20.5 µm (17 - 807 µin)	0.025 µm (1 µin) or 5% relative whichever is greater	0.36 µm @ 8.3 µm (14 µin @ 327 µin)	0.06 µm @ 8.3 µm (2 µin @ 327 µin)
P	4 - 14% P	2% for composition	1.09% P @ 8% P	N/A

Typical performance for Sn/Ni/Cu
using a circular collimator with a diameter of 0.3 mm (12 mil)

			FT230	FT210
Analyte	**Tested range**	**Standard error**	**Precision (2σ)**	**Precision (2σ)**
Sn	2.16 - 9.8 µm (85 - 386 µin)	0.025 µm (1 µin) or 5% relative whichever is greater	0.02 µm @ 4.9 µm (0.65 µin @ 327 µin)	0.02 µm @ 4.9 µm (0.65 µin @ 193 µin)
Ni	0.97 - 15.1 µm (38 - 595 µin)	10% relative	0.082 µm @ 9.5 µm (3.2 µin @ 373 µin)	0.124 µm @ 9.5 µm (4.9 µin @ 373 µin)


X-RAYS ON
Power
Shutter
RAYONS X
CAUTION
In case the window is broken, power off the instrument to avoid radiation hazard
CAUTION
Detector window contains beryllium
CAUTION
RADIATION AND PINCH HAZARD
FT230
XRF Coatings Analyser
HITACHI

Summary

Hitachi's XRF products offer precise analysis of electroplated coatings.

Using Hitachi's traceable calibration standards, routine production samples can be simply and quickly measured by operators of any level. Results appear in seconds, allowing near instantaneous optimization of the production process. Over 1,000 applications have been optimized for Hitachi's coatings analyzers.

With its set of advanced productivity features and leading performance, the FT200 series is the most comprehensive solution for measuring electroplated coatings.



To find out more about XRF analysis of your electroplated coatings visit **hhtas.net/metal-finishing**

Contact one of our experts today at **contact@hitachi-hightech.com**

Hitachi High-Tech Analytical Science

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