

Living up to Life

Leica

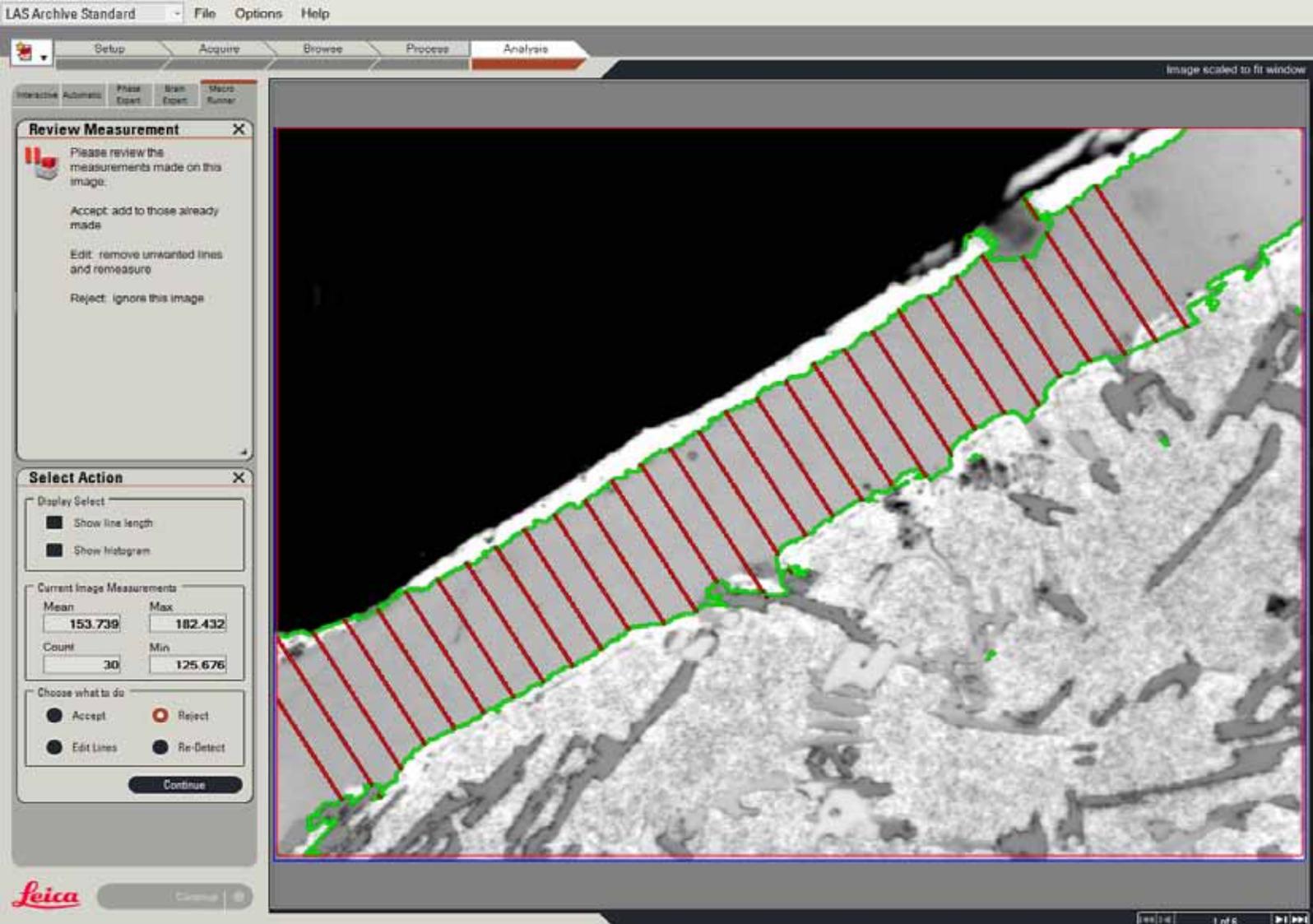
MICROSYSTEMS

INDUSTRY DIVISION



Leica Layer Thickness Expert

Fast and Efficient Software for Layer Thickness Analysis in Industry



COMPREHENSIVE IMAGE ANALYSIS TECHNIQUES

Leica Layer Thickness Expert offers a comprehensive solution for the microscopic analysis of layers and coatings of many different materials such as paint, chrome plating and plastic coatings. The user can be confident that the analysis process conforms to specific laboratory requirements. Leica Layer Thickness Expert incorporates industry standards including ASTM B487 and ISO 1463 for Metallic and Oxide coatings.

The analysis identifies the layer and measures its thickness at multiple points from which the average thickness is derived. As layers appear with a wide variety of contrasts, a range of techniques are used that can range from fully automatic to entirely manual.

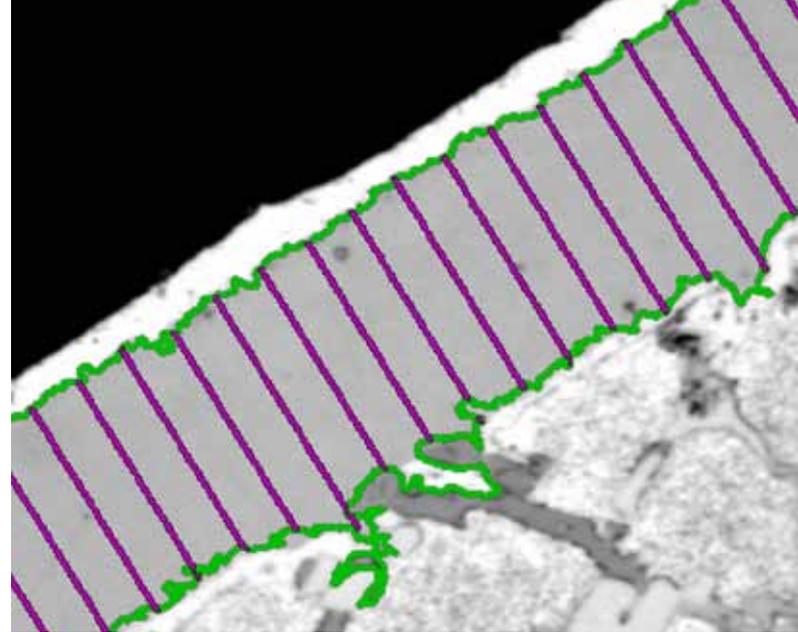
State-of-the-art image processing is used to automatically enhance and accurately detect the layer while the operator can always adjust and confirm the settings. Results from the analysis may be used to qualify material to the specifications determined between purchaser and manufacturer, identify variations in manufacturing processes, or to provide data for research studies of the structure and properties of layers and coatings.

Efficient Imaging Environment

Leica Layer Thickness Expert evaluates high-quality images provided by the Leica microscope hardware. Leica Application Suite (LAS) software intelligently integrates the latest advances in automated microscopy, computing, and digital image analysis. With a wide range of applications designed specifically for materials and metallurgy laboratories, LAS performs routine, yet sophisticated analytical tasks rapidly, efficiently, and economically.

This common micro-imaging environment provides solutions for many industry standard and custom materials applications such as grain sizes, steel inclusion, cast iron, phase and cleanliness analysis. These applications incorporate the understanding of experts in the field to create 'expert' applications dedicated to these specific tasks.

Leica Layer Thickness Expert application software performs automatic, objective, and repeatable layer thickness assessments and simulates industry standards. This analysis is used to evaluate the properties of materials, which helps beside several other techniques to determine the characteristics of a final product.



Customized Expert Features

MEASUREMENT OF LAYERS

- › Color or monochrome images of the layer are acquired using reflected brightfield microscopy.
- › After image smoothing to reduce artefacts, the layer is identified by a color or gray threshold, the sensitivity of which can be interactively adjusted.
- › Debris in the field is automatically removed, leaving only the layer mask.
- › Spurious artefacts that can be caused when the sample is cut, can be removed by image editing.
- › Measurements are made at multiple positions perpendicular to the layer; the number of lines used being defined by the user.
- › Results are accumulated and averaged for the selected images.
- › Once the settings for the analysis have been established, they are saved so that they can be recalled and immediately applied in future.

METHODS FOR IDENTIFYING LAYERS

- › Samples can have a wide variation in contrast and orientation. In response to this, the user can select from one of several available methods that works most efficiently with a given sample.
- › Manual - In cases where lack of contrast makes it impossible to identify the layer by a threshold, the user simply draws lines exactly from edge to edge of the layer using a mouse.
- › Semi-automatic – the coating is detected, and using the mouse, the operator indicates where to perform the measurement.
- › Fully automatic – for vertical and horizontal layers, the application both detects and measures the layer thickness.

DOCUMENTATION OF RESULTS

- › Layer Thickness measurements are given as the mean, maximum and minimum, and other statistical values.
- › Measurements can be accumulated over multiple images if required.
- › Layer measurements are:
 - displayed as a histogram showing the distribution of length
 - shown as labels against each line measured on the image
- › Measurement data and selected images are exported into a Microsoft® Excel™ template.
- › The template can be customized to meet the local documentation standards.
- › Exported data includes the reference data, all raw data, as well as all Layer Thickness measurements and statistics.

Comfortable Advantages saves Time

LAS is designed to increase laboratory productivity and improve the accuracy of analysis by imitating and automating many of the manual processes required for materials analysis. As the analysis is objective, the results are inherently more reproducible.

TOTALLY INTEGRATED SOLUTION

With the combination of Leica microscopes, Leica digital cameras, image analysis expertise and system automation, you benefit from a truly integrated solution from one manufacturer.

VERSATILE REPORTING

Report templates can be configured to laboratory requirements using Microsoft® Excel™. Results are stored along with images, allowing all elements of the data to be recalled for detailed analysis. All data is always available and trackable.

STEP-BY-STEP OPERATION

The application quickly guides the user through the necessary image processing and analysis steps, producing consistent, repeatable results with minimum effort. Once the workflow is defined, these settings can be recalled for repetitive tasks.

COMFORT FOR THE OPERATOR

LAS is simple to use due to its unified method of image acquisition, calibration, and peripheral control. Image analysis reduces the tedium associated with manual measurements while providing improving statistical results.

REPRODUCIBILITY

Obtain reproducible results by automatically controlling imaging conditions with automated microscopes and cameras in combination with predefined image processing settings.

CONFIDENCE IN CONFORMITY

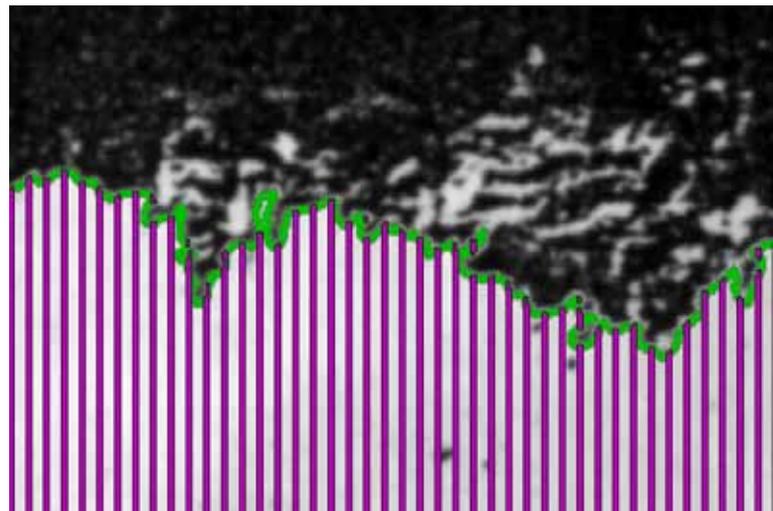
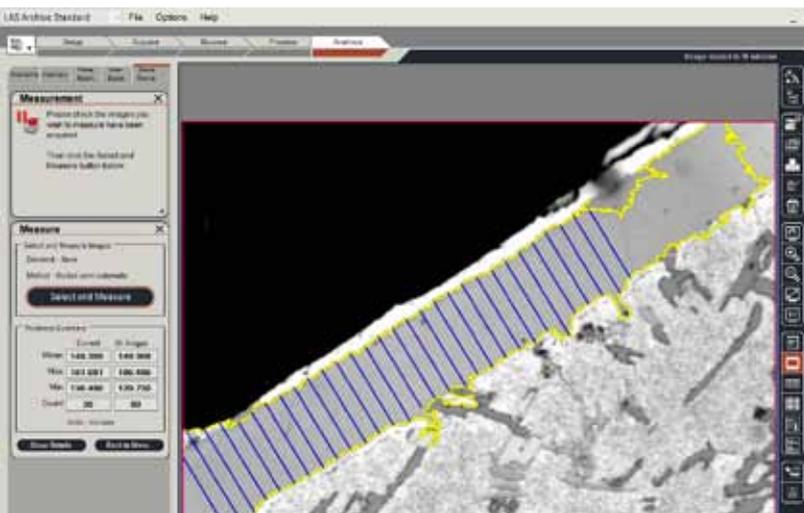
Leica Microsystems' materials application solutions comply with the widest range of appropriate standards available including ASTM, JIS, and ISO, which gives users increased confidence in their results. Instrument Capability: Leica LAS Layer Thickness Expert software performs calculations that derive measurement parameters from digital images and follows procedures that comply with the standards mentioned.*

*The accuracy of the measurements and the compliance of the entire system to these standards strongly depends on a) the optical, electronic, and mechanical components used, b) the working conditions and sample preparation process, and c) the individual and specific interpretation of the results produced. These are the responsibility of the user of the equipment, and Leica Microsystems disclaims any liability in that context.

Intelligent Image Acquisition

Fast and reproducible

- › The first stage of Layer Thickness analysis is to acquire a selection of digital images using LAS and to save them to the computer's hard drive. The advantage of this approach is that you always have the original images available to check your results later.
- › The ability of LAS Layer Thickness Expert to give precise results assumes that the sample chosen is a good representation of the sample being analyzed and has been prepared in a manner that optimizes the contrast of the layer.
- › LAS acquires calibrated images by reading the magnification from the microscope, and the sensor size from the camera, to accurately determine the image dimensions.
- › The imaging conditions such as microscope settings and camera exposure are automatically recorded by the software. The data is stored with the image and can be used to monitor for consistent imaging conditions.
- › Images are named and saved in to a Windows® folder from where they are easily located.
- › Images may be annotated with a calibrated scale bar, customized to your choice of style, and labeled with time, date, image name and description.
- › Optionally capture images at pre-defined XY positions using a motorized stage, which ensures no bias in region selection.
- › Optionally recall microscope and cameras settings from an existing image, which ensures the imaging conditions match previous settings.

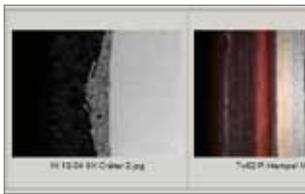


Step-by-Step Operation

Convenient and reliable

1. SELECT IMAGES TO MEASURE

Simply browse to find the folder containing the layer images to be measured and select them by clicking on the thumbnail in the gallery. The first of the selected images is displayed.



2. IDENTIFY LAYER

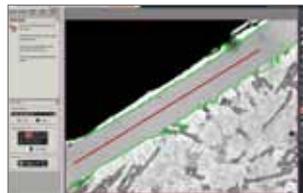
The layer is identified by means of its color appearance and is shown as a mask in a contrasting color superimposed over the image. The color threshold used can be further refined to ensure that the mask precisely identifies the layer. If extraneous detection occurs outside the layer, this can be automatically removed leaving only the layer mask.



3. MEASURE LAYER

The measurement of the lines perpendicular to the layer is now made. If you are

using the Manual method, then each line is drawn with the mouse. With the Semi-automatic method, simply draw a line along the middle of the layer. The automatic methods will produce the measurement lines without intervention by the user.



4. CHECKING THE MEASUREMENT

The lines drawn across the layer are now examined and if spurious lines are noticed, Image Editing allows the operator to use the computer mouse to remove these. Once the lines appear to be correctly drawn, the operator accepts the measurements, and they are accumulated with any previous results.



5. DISPLAY RESULTS

A summary of the results is displayed at each step of the process, and detailed results can be shown as required. This comprehensive detail is invaluable when

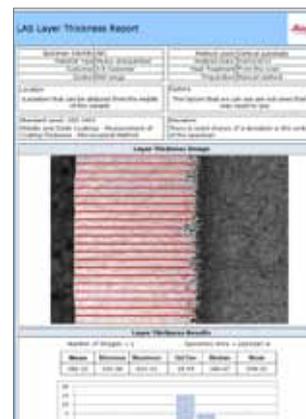
close study of the materials is required.

6. REFERENCE DATA

User and analysis reference information can be added and customized to make the results fully product and company specific. The notes required by the selected standard can be entered. The data entered is automatically transferred to the report.

7. SELECT STANDARD AND REPORT

At this step the required standard is selected. The choice will depend on the local protocol of the laboratory. Reports are created using a Microsoft® Excel™ template supplied with Layer Thickness Expert, and this can be customized to fit the needs of the organization. In addition to the overview data shown on the report, the entire detailed analysis results are stored in the spreadsheet for further evaluation.



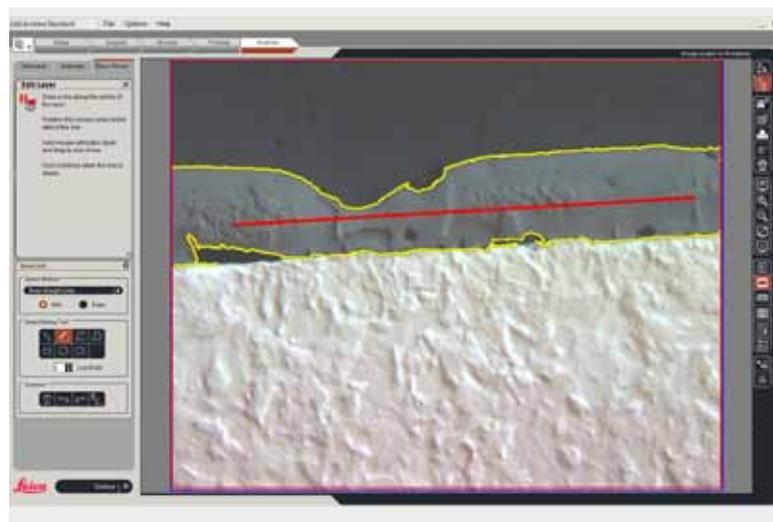
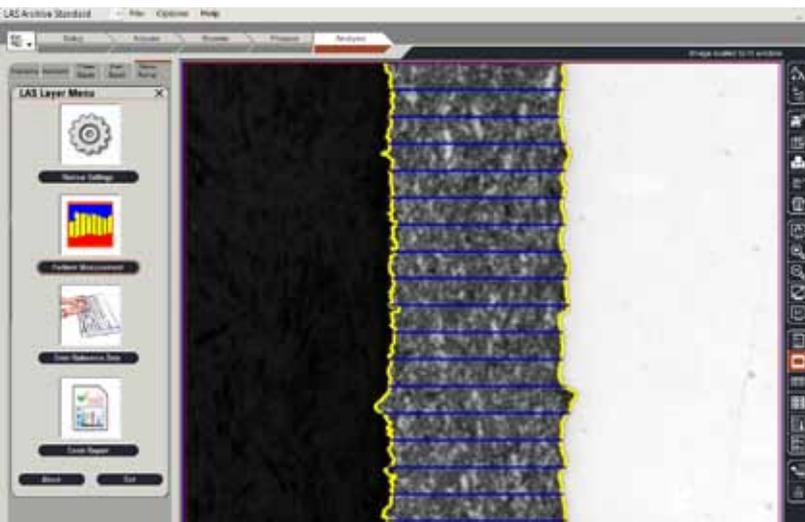




Table of Layer Thickness Parameters

MEASUREMENTS FROM THE LAYER IMAGE

The following are calculated from the lines drawn across the layer:

Mean Layer Thickness, μm

Minimum Layer Thickness, μm

Maximum Layer Thickness, μm

Standard deviation Layer Thickness, μm

Median Layer Thickness, μm

Mode Layer Thickness, μm

The distribution of the layer thickness is shown as a histogram with user defined bins.

Total sample area, mm^2 is also shown

MEASUREMENT METHODS

Manually drawn lines User draws perpendicular lines exactly from one edge to the other across the layer

Constrained drawn lines User first detects the layer and then draws perpendicular lines across the mask and these are automatically restricted to be within the layer mask

Guided semi-automatic. User first detects the layer and then draws a guide line along center of the layer, and perpendicular lines are drawn automatically within the layer mask

Automatic Horizontal. Vertical lines are drawn automatically within the layer mask

Automatic Vertical Horizontal lines are drawn automatically within the layer mask

SOFTWARE ORDERING INFORMATION

12 730 474 Leica Layer Thickness Expert

12 730 218 Leica Image Analysis

Microsoft® Excel™ is required for report generation

Optional complementary software

12 730 074 Leica MultiStep

11 595 045 Leica Store & Recall

RELATED PRODUCTS



LEICA DM2500 M

The efficient Leica DM2500 M microscope for materials analysis and quality control.



LEICA DMI 3000 M

The Leica DMI3000 M inverted, manual microscope for materials science, industrial quality inspection and assurance, and new materials research and development.



LEICA DM6000 M

The universal microscope for all common incident light methods (brightfield, darkfield, polarization, interference contrast, fluorescence contrast).



LEICA DFC450

The Leica DFC450 microscope camera contains a high quality 5 Mpixel CCD sensor for sharp, brilliant images for documentation and analysis in life science, clinical and industry applications.

The statement by Ernst Leitz in 1907, *“with the user, for the user,”* describes the fruitful collaboration with end users and driving force of innovation at Leica Microsystems. We have developed five brand values to live up to this tradition: Pioneering, High-end Quality, Team Spirit, Dedication to Science, and Continuous Improvement. For us, living up to these values means: Living up to Life.

INDUSTRY DIVISION

The Leica Microsystems Industry Division’s focus is to support customers’ pursuit of the highest quality end result. Leica Microsystems provides the best and most innovative imaging systems to see, measure, and analyze the microstructures in routine and research industrial applications, materials science, quality control, forensic science investigation, and educational applications.

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