# System Specification Options

We are able to offer system options to fit your specific requirements in terms of sample throughput, automation and budget

**Hardware for automated steel inclusion rating**

- Leica DM 6000M upright compound microscope with incident optics, 5X, 10X and 20X lenses, brightfield illumination, optional darkfield with 4x4 Merzhaeuser scanning stage and stage control board

- Or Leica DMI 5000M inverted compound microscope with incident optics, 5X, 10X and 20X lenses, brightfield illumination, optional darkfield, with scanning stage and motorised focus and a stage control board

- Or Leica DM 4000M upright compound microscope with incident optics, 5X, 10X and 20X lenses, brightfield illumination, optional darkfield with 4x4 Merzhaeuser scanning stage, external motor focus and X/Y/Z control board

- Leica DFC290 digital camera

- Leica Application Suite (LAS) with Leica Steel Expert application software

- 0.63x  C-mount adapter

- Calibration slide for length calibration

**Hardware for semi-automated steel inclusion rating**

- Leica DM 2500M upright compound microscope with incident optics, 5X, 10X and 20X lenses, brightfield illumination, optional darkfield

- Or any other Leica upright or inverted materials compound microscope with incident optics, 5X, 10X and 20X lenses, brightfield illumination, optional darkfield

- Leica DFC290 digital camera

- Leica Application Suite (LAS) with Leica Steel Expert application software

- 0.63x  C-mount adapter

- Calibration slide for length calibration

**Software**

The software can be used in two modes with differing authorisation levels in relation to the special requirements in Quality Assurance:

1. Super User - Authority to define measurement parameters and inclusion types to be measured, limit values for chart field grading, as well as all the functions included in Standard User

2. Standard user  - Authority to change the samples, input measurement specific data, set up the image, focus, start the measurement, store and print data, check validity of results with worst field and worst inclusion finder option.

For further information, please contact your local Leica representative:

# Leica Steel Expert

Analysis Software for Automatic or Semi-Automatic Steel Inclusion Rating

@ www.leica-microsystems.com/Steelexpert

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MICROSYSTEMS

## Automatic Steel Inclusion Rating

Leica Steel Expert is a highly specialised software programme for automatic and semi-automatic steel inclusion rating running in the established Leica Application Suite (LAS) environment. The quality of steel is highly dependent on the content of non-metallic inclusions generated during steel alloying and production. Traditional methods of characterising steel inclusions manually, using comparison charts that refer to internationally defined rating standards, have proved to be very time consuming and inaccurate. This has been due to the ambiguous nature of these standards and has meant that were often open to subjective application. Leica Steel Expert, bridges these gaps by providing a powerful software solution that brings fast, reproducible and accurate results to the process of automated and semi-automated inclusion rating for stainless steel alloys.

## Critical Quality Factors

As steel manufacturers have to certify the quality of their steels to be competitive in the international market, Leica Steel Expert allows the verification of the different types of non-metallic inclusions in steel alloys. The inclusions are classified and graded according to their shade and colour. Black inclusions such as globular oxides, silicates and aluminium oxides are identified by shape, size and arrangement. Furthermore, as global networking forces manufacturers to communicate their results set to established international standards so that steel quality can be compared, Leica Steel Expert provides full compatibility with most established industrial standards including ASTM E45 A, D and E, ISO 4967 A and B, DIN 50 602 with K and M methods, JIS G0555 and is prepared for the anticipated new EN10247, a release that is expected in the near future. The comprehensive nature of Leica Steel Expert means that all standard results can be displayed at the same time for easy comparison. Furthermore, these comparable results can now be generated in different laboratories all over the world. The automated image analysis provided by Steel Expert means that all conditions are highly reproducible and objective.

## Feature Highlights:

- An easy to use solution operating in the modern Leica Application Suite environment
- Complete control of all imaging conditions such as microscope and camera settings for highly reproducible measurements
- Full integration of modern fully automated Leica DM series compound microscopes and Leica DFC digital cameras
- Classifies and grades inclusions by shade and colour as well as shape and arrangement
- Data accessible in raw, processed and histogram format
- Fully compatible with International standards such as ASTM 45 A, D and E, ISO 4967 A and B, DIN 50602 K and M, JK and JIS 0555
- Prepared for the anticipated new European standard EN 10247
- Measurement results can be viewed independently from magnification and all standard results can be displayed simultaneously for easy comparison
- Complete control over measurement results with worst inclusion and worst field finder and editing options are available in the fully automated version
- Manual positioning of an arbitrary number of fields of view for the identification of worst inclusions or worst fields in the semi-automated version
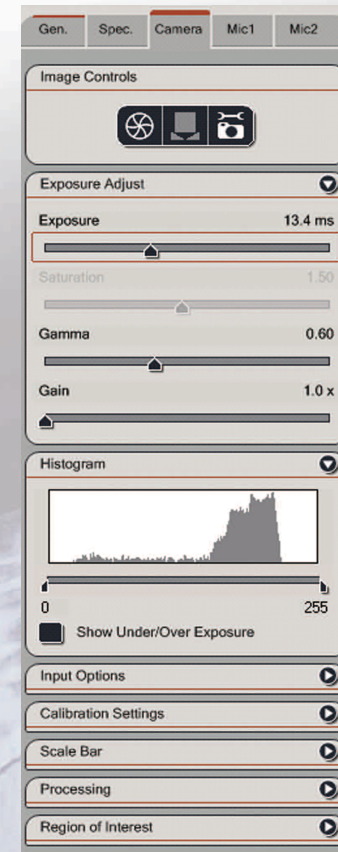
## Automatic Steel Inclusion Rating

The Leica automated upright or inverted light microscopes enable polished steel samples to be easily inspected with bright field illumination. When combined with Leica Steel Expert, fields of arbitrary size on either single or multiple samples, which are mounted on the motorised scanning stage, can be automatically scanned and measured. The predicted focus option ensures that the sample or samples remain at the correct focal point during each automated measurement. Furthermore, Leica Steel Expert provides a unique display mode allowing the user to monitor the measurement and check that the different inclusion types are being correctly identified.

Non-metallic inclusions are detected and classified by grey value (differentiation between sulfide and oxide inclusions) and by size, shape and arrangement (differentiation between globular, silicate and aluminate inclusion types). Depending on the amount and size of these different inclusions, a rating is generated for steel that defines its quality in relation to international standards. The results can be stored and printed. To check the validity of results, particularly of the worst fields or largest inclusions (which have the most influence on the final grading), these fields can be reviewed in live image mode and artefacts can be removed.

The workstation for steel inclusion rating can be individually combined from different system components. For the high-end segment, Leica Steel Expert can be used together with the fully automated compound microscopes Leica DM4000/6000 M and the inverted light microscope Leica DM5000 M.

## Semi-Automatic Steel Inclusion Rating

The semi-automatic version of the Leica Steel Expert software works with any manual incident light microscope. The user defines the fields to be measured, the software performs then the recognition, classification and grading of the inclusions. This can be used, when only worst inclusion or worst field determination are required.