Automated Particle Counting Systems
Fast, Accurate Measurement Data
The OLYMPUS Inspector Series

Product reliability and quality assurance is the focus for 21st century manufacturing and the acquisition of accurate and reproducible metrology data a top priority. Olympus expertise in imaging and metrology systems provides today’s manufacturers with an experienced technology leading partner to provide solutions for particle counting, sizing and classification. The practical application of the particle size and distribution can directly impact the performance, life-time and reliability of many manufactured products. Current applications of OLYMPUS Inspector Series range from quantifying residual particulates on automotive components to analyzing defects and rating non-metallic inclusions in steel.

Turn Key Systems

Olympus offers three different microscope-based turn key systems providing automated high throughput image analysis solutions: OLYMPUS Filter Inspector for automated residue analysis of circular filters; OLYMPUS Particle Inspector for advanced automated particle analysis; and the OLYMPUS Inclusion Inspector for automated rating of non-metallic inclusions in steel.

Automated and Accurate System Solutions

To quantify particles with high efficiency and reliability for manufacturing, quality control or in research and development laboratories, you need to process a high number of images both accurately and quickly. The OLYMPUS Inspector Series has been developed to provide accurate and reproducible measurement results. Each system consists of the dedicated particle detection software, an Olympus microscope, digital camera, motorized stage with controller and PC.

Ease of Use

The systems are designed to provide you with an intuitive workflow from acquisition through standardized documentation. Accuracy of results is guaranteed with the use of motorized focus capabilities, a dedicated particle standard calibration slide and latest image analysis techniques. In addition, accuracy is validated post scan through go-back-to-particle function, driving the stage to the exact location of the particle in question.

Start a New Sample

1 Acquire Images

2 Process Results

3 Analyze Data

4 Create Report
Analysis of residue requires the determination of the number of residue particles on the entire filter.

Manufacturing defects like pores or blowholes influence the mechanical properties of materials.

The quality and properties of steel are highly depended on the nonmetallic inclusions in steel.
Efficient and Reliable
OLYMPUS Inspector Series: Automates Typical Inspection Tasks

Intuitive User Guidance
The user-friendly big button concept reduces errors and improves reproducibility, guiding the user step-by-step through the entire analytical process - from image acquisition through to reporting. Even the most complex image analysis tasks are executed quickly, accurately, and in compliance with most common international standards.

System Settings and User Profiles
System settings are defined once during the initial system configuration by an administrator or advanced operator. Password protection is included to avoid accidental changes to system settings and user profiles during the analytical process.

Perfect Setup
The automated microscope components and camera are controlled in real-time. The user can also set exposure times, focus the image, change objectives, and apply color or shading corrections as needed.

Acquire Image
Image acquisition is integrated in a simple workflow that reduces errors and improves reliability. Integrated tilt-compensation and predictive focus algorithms during the scan guarantee focused images.

Process Results
The frame-independent multi-image detection ensures full reconstruction of particles at image borders and a particle size independent image analysis from a few microns up to several millimeters.

Example of the OLYMPUS Inspector Series user interface.
Analyze Data

The OLYMPUS Inspector Series offers a selection of multiple complex particles (fibers, reflecting particles, stringers or globule) as well as the capability to create your own particle selection method.

Create Report

The OLYMPUS Inspector Series integrates a complete report tool for professional reporting without any user interaction and a powerful data management tool for automatic archiving and retrieval of data.

Data Security

During the detection process, measurement data is recorded at the moment of acquisition. If the process is interrupted, the data acquired up to that point is retained for future use.

Classification

The detected particles are counted, measured and classified immediately. Particles can be classified based on more than 100 predefined parameters.

Revision and Reprocessing

All results are automatically archived into the integrated database. The database offers the ability to revise the results or re-process the data if new or updated standards are applied.

Standardized Documentation

The OLYMPUS Inspector Series integrates a complete reporting solution for professional reports according to international standards or to internal company standards.
Efficient and Reliable
Focus On Ease of Use

Single Source Solution
Olympus provides all software and hardware components, seamlessly integrated to provide highly accurate, fast and reproducible measurement results, as well as making standardization of inspection equipment for multiple sites efficient and straightforward.

Predictive Software and Laser Autofocus
OLYMPUS Inspector Series offers an integrated tilt compensation, that extrapolates the tilt of the sample, either linearly or non-linearly, during the scan. A laser-based autofocus can be integrated with the microscope’s motorized focus to automatically lock in focus in real-time, ensuring all detectable particulates are properly in focus.

Performance Verification
To ensure accurate measurements, Olympus offers a particle standard designed to verify system calibration for various particle shapes and sizes.
Efficient and Reliable

**Accurate and Reproducible: The Particle Detection**

The OLYMPUS Inspector Series reconstructs the entire sample and creates a complete particle map, independent of sample size. This image can then be used in a report, as required by national and international standards.

**Powerful Particle Detection Engine**

The OLYMPUS Inspector Series possess a powerful, fast and accurate frame independent multi-image detection of real particles, based on the gray level threshold together with a comprehensive set of morphological parameters. More than 100 standard parameters are implemented.

**Flexible Particle Identification**

To maximize efficiency, particles are detected immediately which gives you direct access to particle identification of fibers, reflecting and non-reflecting particles, stringers or globular particles.

**View Your Entire Sample**

The OLYMPUS Inspector Series reconstructs the entire sample and creates a complete particle map, independent of sample size. This image can then be used in a report, as required by national and international standards.

**Display and Monitoring Results**

The system automatically creates several standard documents: automatic acquisition of the largest particles, article result sheet, display of the particles in colors associated with the size classification and a particle map representing the whole sample.
Cleanliness Standards
ISO 4407:1991, ISO 16232,
NF E 48-651, NF E 48-655,

Nonmetallic Inclusion Rating in Steel
ASTM E 45, EN 10247,
DIN 50602, ISO 4967,
GB/T 10561, NF A 04-106,
UNI 3244, JIS G 0555

Compliant with Industry Standards
The mandatory regulations for counting and classifying contamination are defined in corresponding international,
national, or company standards for the respective branches of industry such as ASTM, ISO, or JIS. With its extensive data
mining capabilities the OLYMPUS Inspector Series classifies the data according to these standards and norms. It is also
possible to create user-defined rules that can be utilized by customers or internal regulations.

Approval Flag
The integrated approval test of the OLYMPUS Inspector Series software minimizes the time to determine if the part
has passed or failed inspection. The system automatically assigns an ‘OK’ or ‘Not OK’ flag to a particular size class
according to the user-defined limits of the measurement values and/or code numbers. This integrated approval test
gives users a deeper view into the results, saving both time and money.

Revision and Re-Classification
The revision mode gives direct access to each detected object. You can easily separate, delete and draw particles,
or perform a complete re-classification. The OLYMPUS Inspector Series provides the ability to comply with internal
company standards. It is also possible to re-process the existing data using different parameters or create a new
classification scheme. Revision and re-classification are a no-risk operation.
Reporting

The OLYMPUS Inspector Series integrates a complete report solution for professional reporting. Reports are automatically generated with all the relevant measurement results for the standard selected and report content can be fully customized to match the user’s requirements.

Archiving

The OLYMPUS Inspector Series integrates a powerful data management tool for automatic archiving and retrieving of all documents including images and data files. The database can be modified to suit the specific requirements and offers many advantages, including the ability to re-examine stored samples if new or updated standards are available.
Single Source Solution

A Series of Complete Systems

The OLYMPUS Inspector Series systems are optimized for fast, accurate and precise operation. Software and hardware components are selected to reduce complexity and increase throughput. Systems consist of a microscope frame, digital camera, motorized stage, controller and sample holder that meets the applications and customer’s needs for optical resolution, illumination and throughput.

Particles Larger than 2 µm

The numerical aperture of the Olympus plan fluorite objective lenses employed on both the Olympus BXiS and MX61A microscopes provide the optimal resolution for detecting particles between 2 - 15 µm.

Particles Larger than 15 µm

The resolution and depth of focus of the Olympus SZX16 microscope provides the best solution for detecting particles larger than 15 µm.

Polished Cross Sections

The OLYMPUS GX series of inverted metallurgical microscopes can also be used together with the OLYMPUS Inspector series. An ideal combination for the study of steel and nonmetallic inclusions.

Camera Selection

Olympus digital cameras have been tailored to obtain the best performances in combination with OLYMPUS microscopes. Both 2/3 inch color and monochrome cameras are available in addition to a cost effective 1/1.8 inch color CCD camera. All cameras use the IEEE 1394 Firewire connection and are compatible Windows 7-32 bits.
The OLYMPUS Particle Inspector addresses the need for advanced image analysis in addition to classical particle detection and analysis. The integrated focus-mapping function improves particulate detection and measurement accuracy for advanced materials with varying topographies.

The purity of steel depends highly on the content of nonmetallic inclusions coming from the production process. Reliable and accurate monitoring of these nonmetallic inclusions is an important quality factor as demand for high quality steels rises every year. OLYMPUS Inclusion Inspector provides a reliable and accurate analysis and rating of nonmetallic inclusions in steel, without tedious manual observation work.

Filter residue analysis is an essential part of analyzing cleanliness for liquids and high precision parts. Detecting, visualizing, identifying and reporting residual particles found on filter media help automotive and aerospace engineers quantify contamination, that in turn affects the performance, lifetime and reliability of final products. Microscope-based residue analysis helps determine the size of particulate contamination down to the micron level. Particles are measured and then classified in compliance with relevant standards.

Particle inspection is of interest for advanced material research applications.

Steel microstructure with superimposed reference image as overlay for live evaluation.
OLYMPUS Inspector Series Specifications

### Basic Image Acquisition
- Live image acquisition: Captures live image in various format
- Live overlay: Displays crosshair and measurements in overlay

### Basic Image Tools
- Image processing and filters: Enables contrast adjustment, edge detection, smoothing and sharpening of images and shading correction
- Static annotations: Draws text, arrows, lines, rectangles and ellipses on the image

### Interactive Measurements
- Field of view measurement: Measures distances (vertical, horizontal, arbitrary), counts and line profiles
- Advanced measurement: Measures angles, magic wand, polygon and ellipses

### Olympus Device Control
- Olympus microscope control: Controls motorized Olympus microscope systems BX2, BX, SX2, SXZ2 and MX, reads out Prior SX2-E
- Olympus cameras: Controls Olympus cameras and old compatible models (RoHS and non-RoHS)

### Extended Image Acquisition
- Software autofocus: Perform contrast-based software autofocus
- Predictive autofocus with 3 points: Perform predictive autofocus using a focus plan defined by 3 points on the sample
- Predictive autofocus using focus map: Perform predictive autofocus using a focus map generated from multiple points

### Reporting
- Worksheets and graphs: Exports measurement data to Microsoft Excel, including statistical analysis of measurements
- Report generator: Creates report based on user defined templates

### Advanced Customization
- Particle classification: Allows the creation of customized particle classification scheme
- Macro recorder: Allows recording and editing of macros
- Definition of circular scan areas: The scan area is defined by 3 points located on a circle circumference
- Definition of geometric scan areas: The scan area can be a rectangle, a circle or a ring. Areas can be defined interactively
- Identification of particles family: Creation of user defined particle family (reflecting, fibers, colored, etc) for an immediate identification

### Extended Image Tools
- Image arithmetic: Performs arithmetic and logical operations with image

### Basic Image Analysis
- Phase analysis: Performs threshold-based phase segmentation on full images or polygonal ROIs, calculates area and area fraction

### Data Management
- Integrated image database: All images and results are immediately recorded in a relational database for further analysis (uses Microsoft Jet Engine)
- Operator mode: Limit the access to the only necessary functions
- Automated Z-stack acquisition: Automatically acquires Z-stacks (requires motorized Z)
- Big button workflow: Access to all Olympus Inspector functions with dedicated interface
- Frame independent detection: Merging of objects which are larger than the field of view
- Live detection: The detected particles are displayed on the screen with no delay

### Stage Control
- 3rd party stage controls: Controls XY stage controllers from Objective Imaging, Prior ProScan, Ludl MAC, Märzhauser, ITK and LANG

### Data Management
- Integrated image database: All images and results are immediately recorded in a relational database for further analysis (uses Microsoft Jet Engine)
- Operator mode: Limit the access to the only necessary functions
- Revision mode: Revision of the performed analysis and repositioning the detected particle for visual inspection

### International Standard Support
- Non-Metallic Inclusion Rating in Steel: ASTM E 45, EN 10247, DIN 50602, ISO 4967, GB/T 10561, NF 45-106, NF 3241, JIS G 0555

### Material Science Modules
- Grain sizing intercept: Measures the average grain size on etched steel samples according to ASTM E 112, ISO 643, JIS G 0551 and JIS G 0552
- Grain sizing planimetry: Measures the distribution of grain size on etched steel samples according to ASTM E 112, ISO 643, JIS G 0551 and JIS G 0552
- Dendrite arm spacing: Measures the dendritic arm spacing in aluminum castings
- Decarburization depth: Determines the depth of decarburization according to the relative amount of free ferrite in the steel
- Banding: Measures the level of banding on hot rolled medium carbon steel
- Weld measurements: Measurements of weld cross sections (thread thickness, asymmetry, parallel and transversal distance)
- Micro hardness measurement: Measures the Hardness (Vickers and Knoop) from a micro-hardness test print
- Layer thickness measurement: Measures the layer thickness of single or multiple layers
- Point count: Performs phase analysis according to ASTM E 562
- Coating: Measures the layer thickness of coating from prints produced by the calotte method

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