ZEISS ZEN 2 core

Imaging Software for Connected Microscopy
in Material Laboratories

Imaging Software for Connected Microscopy in Material Laboratories

ZEN 2 core is powerful software for microscopy imaging, automated control of motorized ZEISS microscopes, and multi-modal workflows in material laboratory environments.

Use ZEN 2 core imaging software to handle routine tasks on a wide range of ZEISS microscope or camera systems. While extracting the highest technical performance from your microscopes, ZEN 2 core provides access to every parameter and function you might wish to optimize through an intuitive and configurable graphical interface.

Or use ZEN 2 core to create task-specific workbenches that show only the required microscope controls on the screen. Combine these workbenches to create dedicated jobs that assist your operators through a defined flow of consecutive tasks, to ensure data repeatability in a multi-user environment.

ZEN 2 core also helps you to make your laboratory even more productive. With workflow solutions that connect data from different microscopes, ZEN 2 core delivers more meaningful information in the form of correlated multi-scale and/or multi-modal characterization data. And thanks to its database connectivity features, you keep your valuable data together across instruments, laboratories, and locations.
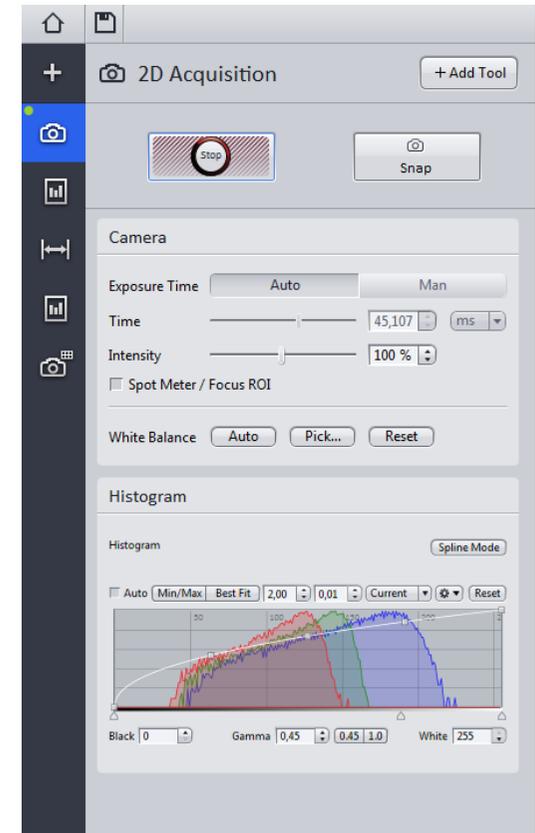
Simpler. More Intelligent. More Integrated.

Easy to Configure. Easy to Use.

ZEN 2 core gives you the benefit of an adaptive user interface tailored to the needs of industrial and research environments. The easy-to-follow GUI configuration accommodates tasks of all kinds and any complexity.

ZEN 2 core also offers you configurable user management, so you can specify users and user roles. Whatever their level of experience, operators will learn the software quickly.

Using the ZEISS Word Add-In lets you easily create user configured report templates in MS Word®. The reporting functionality exports reports to various file formats including PDF or .docx.
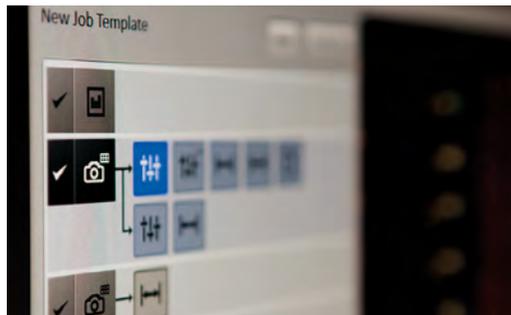
Advanced Imaging and Automated Analysis

ZEN 2 core is the command center for automated imaging and analysis functions on compound light microscopes.

By using built-in automated image acquisition routines, such as HDR or Best Image, you benefit from the consistency of an advanced and repeatable workflow.

ZEN 2 core provides automated image analysis functionality such as histogram segmentation, phase analysis or particle counting by size and shape.

Application-specific modules enhance your microscope to answer typical questions about the material structure in research and quality control.

Infrastructure Solution for the Connected Lab

ZEN 2 core provides the infrastructure for connected laboratory environments, linking all your ZEISS imaging and microscope solutions to a single, familiar GUI.

ZEN 2 core is also the interface to the ZEISS Axiocam camera portfolio, safeguarding an open connected laboratory architecture for 3rd party solutions that interface through an Axiocam camera.

Shuttle & Find, the ZEN 2 core workflow solution for correlative microscopy, bridges different forms of light and/or electron microscopy, improving productivity and multi-modal data integrity.

And finally, database connectivity features help you to keep your valuable data together across instruments, laboratories, and locations.

Expand Your Possibilities

One Interface for all Microscopes in a Multi-User Environment

ZEN 2 core provides a single, powerful user interface to control and connect ZEISS cameras and microscopes. No matter if you perform routine inspection on a Stemi 305, or advanced characterization on an Axio Imager, you always benefit from a consistent and intuitive GUI design. Experience ease-of-use and best-in-class microscopy thanks to the rich feature set for imaging, analysis and automation.
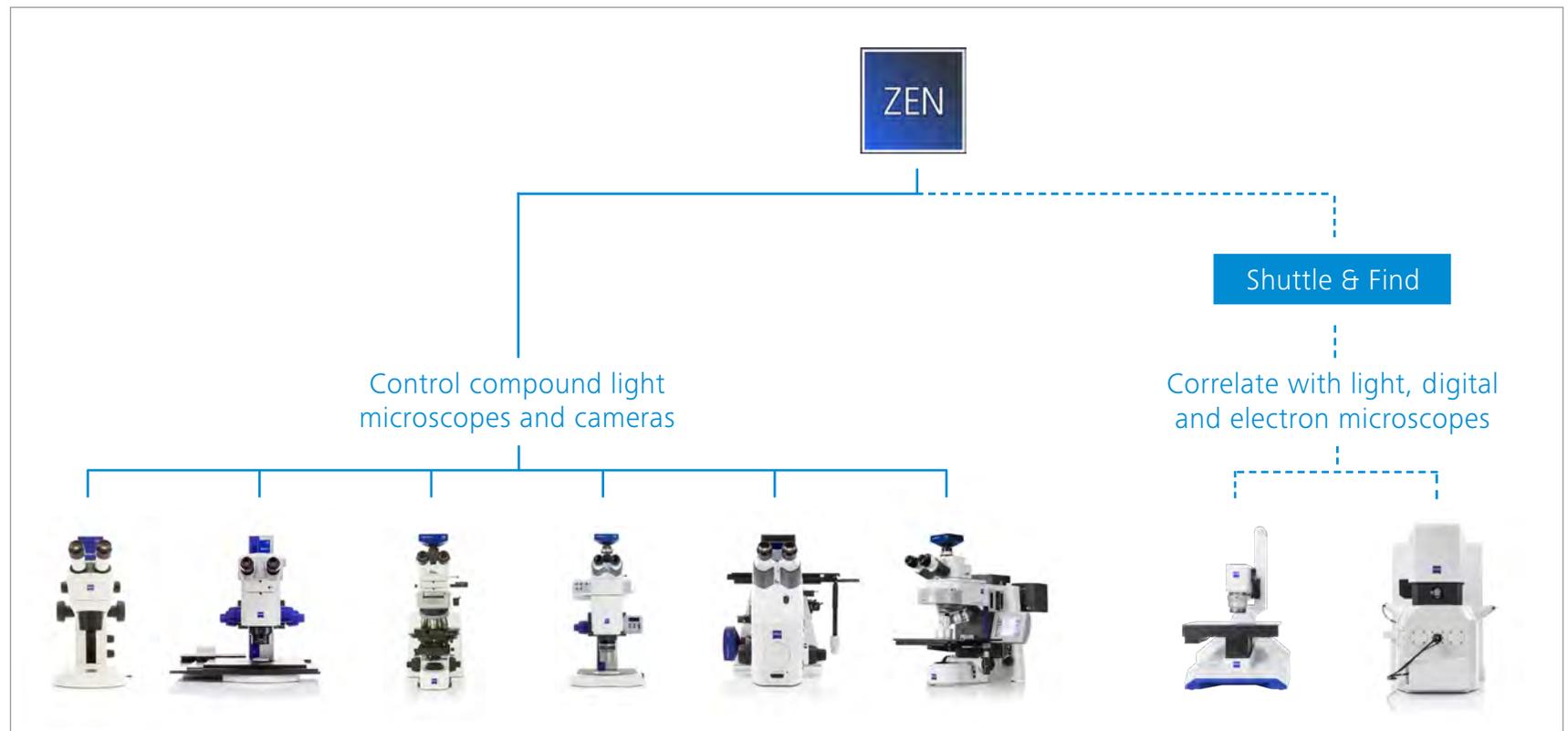
From entry-level stereo microscopes to motorized and fully automated imaging systems, ZEN 2 core provides a unified user interface for ZEISS microscopes and cameras. With the Shuttle & Find module, ZEN 2 core also links and bridges compound light, digital and electron microscopy.

Expand Your Possibilities

User Management Designed to Assure Data Repeatability and Integrity

Supervisor
Experienced User

Operator
Routine User

Administrator
Lab Manager

Job Mode		Maintenance Mode
Create & manage job templates → Run job templates		Manage user accounts
Browse job results ← Report job results		Maintain settings and calibration
		Manage data
Free Mode		
Perform free examinations		
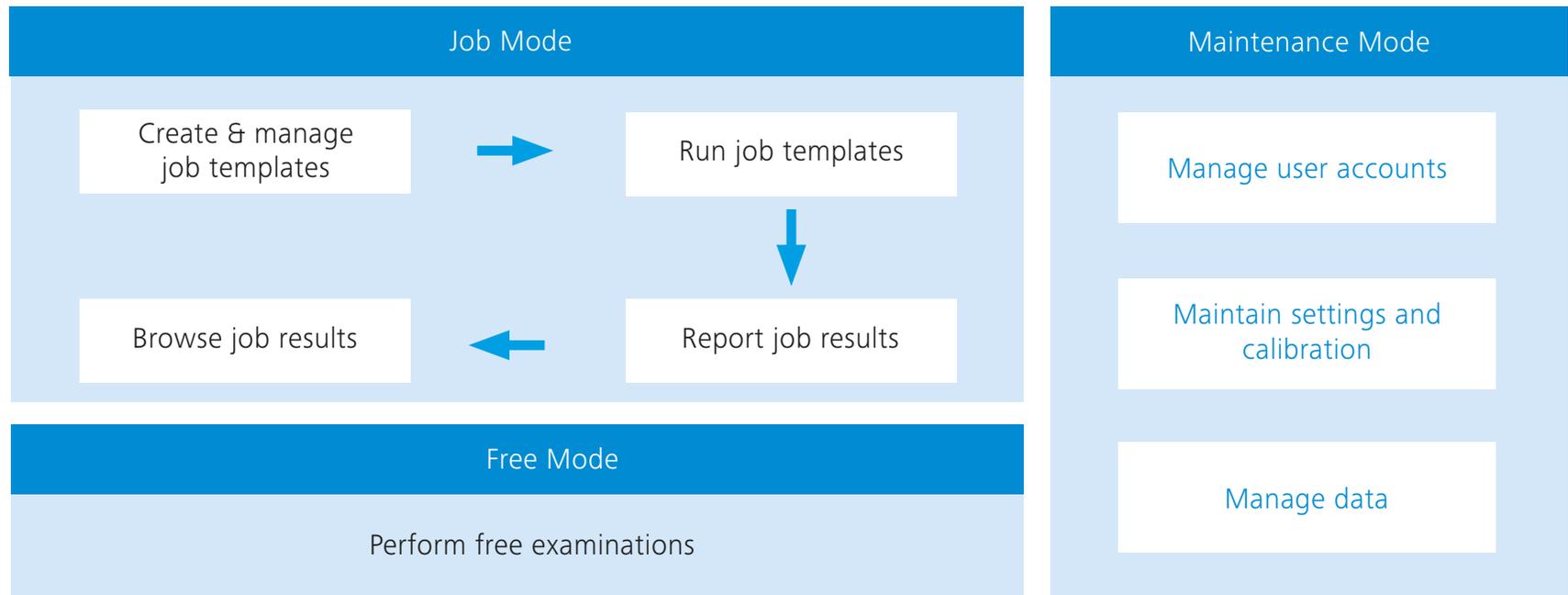
Sample configuration of multi-user management

Expand Your Possibilities

Job Mode

Easily set up workflows for repetitive tasks with Job Mode. Microscope parameters can be predetermined and specified as individual workbenches to guarantee reproducible results. Workbenches can be combined within a job template to set up individual workflows. Parameters within the workbenches (e.g. camera exposure time) in a job template can be locked to assure consistency in sample examination. Combine Job Mode with user management functions to assign inspection tasks to certain users and user groups.

Workflow Example

Step 1	Step 2	Step 3	Step 4	Step 5
User form to enter sample information, project name or user data	Image acquisition combined with Tiles, EDF or 3D functionality	Interactive or automatic measurements	Automated reporting	Automated archiving of relevant data
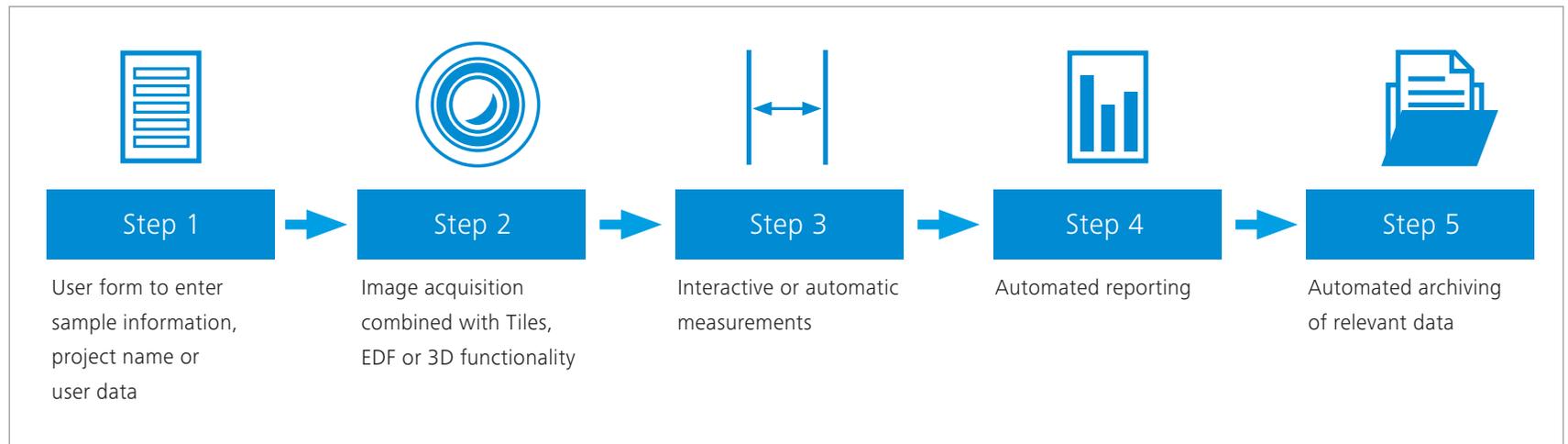
Expand Your Possibilities[1]

Imaging Solution for Cameras, Microscopes and Multi-modal Workflows

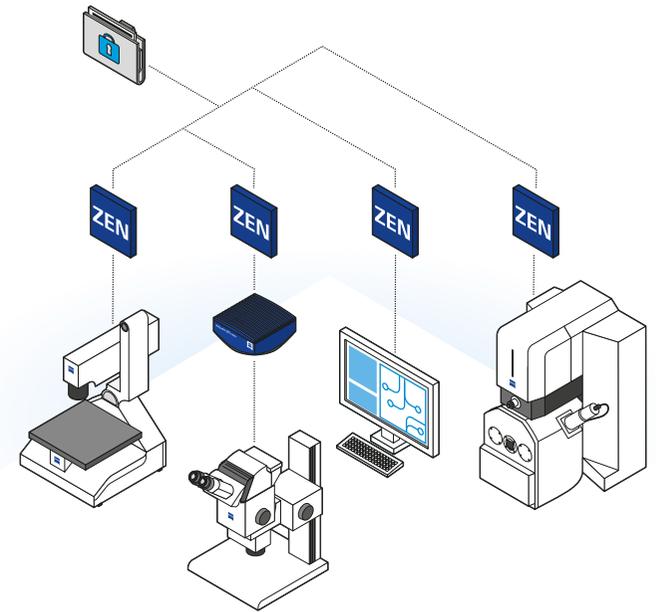| Manual Microscope and Camera	Motorized Microscope and Camera	Multi-modal Workflows
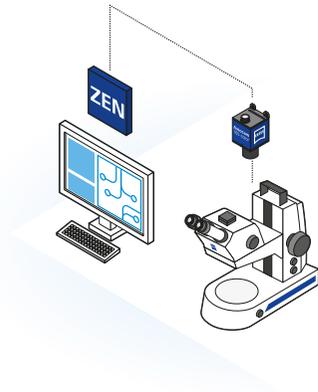
- Software: ZEN 2 starter
- Control of the camera for image acquisition
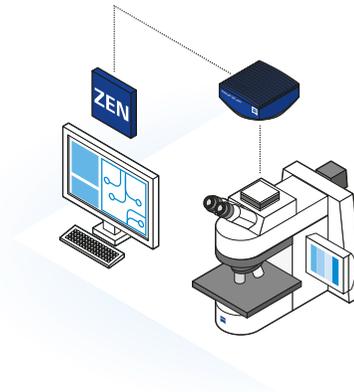
- Software: ZEN 2 core
- Full control of the motorized microscope
- Optional fully functional image database IMAGIC IMS[1]
- Internal file archive

- Software: ZEN 2 core
- Connects different cameras and microscopes
- Manages correlative workflows between compound light, digital and electron microscopy via Shuttle & Find
- Integrates office workstations for image analysis and reporting
- Internal file archive (basic network functionality)
- Optional fully functional image database IMAGIC IMS[1]

[1] Only available in specific countries

Expand Your Possibilities[1]

Connectivity between Systems, Laboratories and Locations
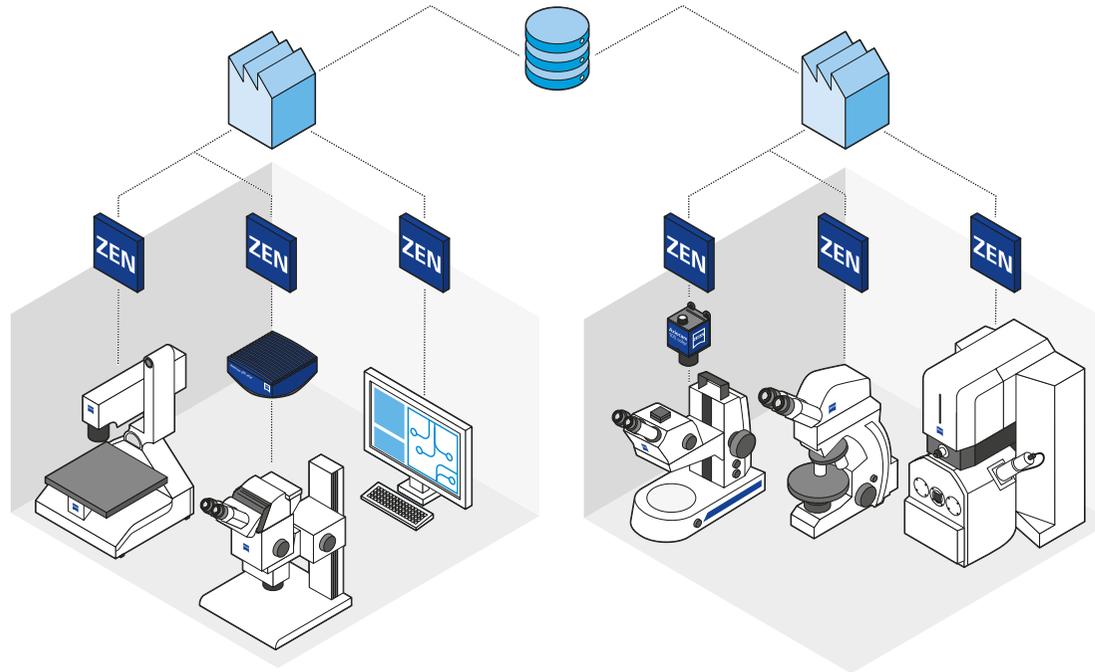
Features

- Maintain data integrity across systems, laboratories, and locations
- Scalable database sizes according to customer needs
- Centralized user management
- Exchange of job templates and results

IMAGIC IMS database interface[1]

- Standardized interface between IMS and individual ZEN 2 core installations
- Optional: LIMS interface
- Optional: LDAP user management
- Optional: Office client modules
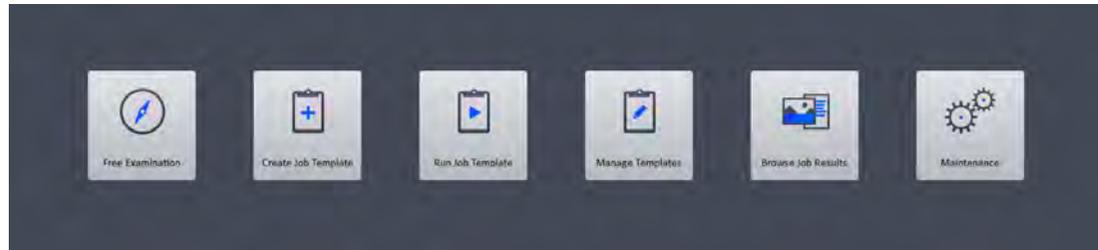- Optional: IMAGIC IMS reporting & publishing
- Optional: IMS Publisher

[1] Only available in specific countries
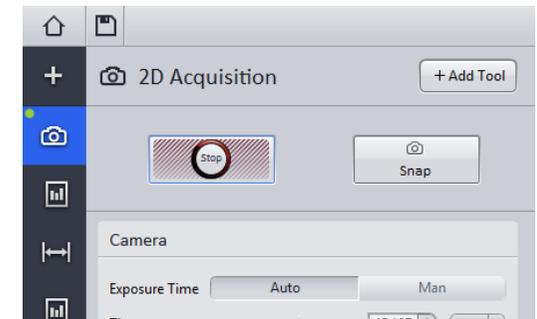
ZEISS ZEN 2 core at Work

Standard Features

ZEN 2 core home screen: Access to image acquisition and job functions
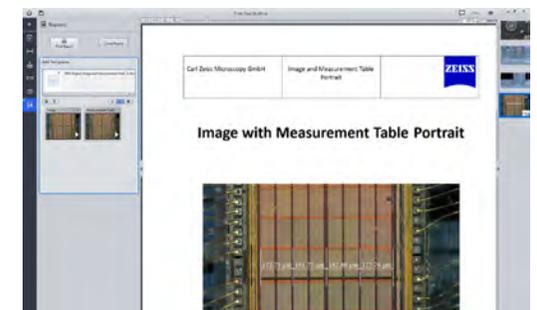

Preconfigured workbench

- Full operational control of ZEISS microscopes, cameras, and components
- Workbenches for repetitive application tasks
- Single and automated panorama image acquisition
- User management functionality
- High Dynamic Range (HDR) image acquisition
- Create and manage input forms
- Live image video recording
- Image and data information displayed in datazone below the image

- Best Image functionality
- Enhanced depth of field via manual focus
- Measurement functions
- Microsoft Word® reports and report templates
- Data archive for images, documents and templates
- Image export to all standard image formats such as JPG, BMP, TIFF
- Connection to ConfoMap
- Extended workflow capabilities, loop functionality

Measurement functions

Reporting template

ZEISS ZEN 2 core at Work

Solutions for Materials

Grain Size Analysis

Determine grain sizes in three different methods according to international standards

Cast Iron Analysis

Analyze form, size and distribution of graphite particles in cast iron

Multiphase Analysis

Automatic measurement of particle size and area content of multiphase samples, also evaluation of porosity

Comparative Diagrams

Compare micrographs with standardized or customizable comparative charts (Wall Charts)

Layer Thickness Measurement

Automatic or interactive thickness measurement of different layers

Optional Modules for Advanced Functionality

Enhanced Depth of Field

Automatically acquire multiple images at different focus positions (Z-stack) and combine them to an image with enhanced depth of field

Tiles & Positions

Record exact, highly resolved images of multiple field of views by automatically scanning pre-defined areas

Software Autofocus

Automatically determine the optimum focus position on your sample

ZEN 2 core Macro Environment

Integrated Development Environment (IDE) with editor and debugger. Enables intermediate users to customize and automate ZEN for their needs with a selected set of commands.

Shuttle & Find

Correlative Microscopy module links images and data from different light and/or electron microscopes in a multi-modal workflow

GxP Module

Audit Trail and process insurance. Precondition for 21 CFR Part 11 compliance.

Data Management

Interface module to seamlessly connect to IMAGIC Database Server

Online Measurement

Measurement capability in the live image with save and burn-in capability

Automated Image Analysis

Creation of automatic measurement workbenches, e.g. for phase analysis or particle analysis

Linkam (Hardware Control)

Interface to control Linkam heating and cooling stages

Advanced Processing & Analysis

Add hierarchical measurements and more processing to your image analysis

ZEISS ZEN 2 core at Work

**Automation for Compound
Light Microscopes**

Obtain results – rapidly and repeatably. ZEN 2 core
provides you with a wide range of choices for
automated image acquisition:

- Best Image: assists you with the optimum
  microscope settings for image acquisition.
- HDR: ensures best image quality even with
  challenging light conditions.
- Panorama and Tiles: create stitched images in
  just a few clicks.
- Autofocus: automatically determine the perfect
  focus position for your sample.
- EDF: Automatically acquire multiple images at
  different focus positions and combine them to
  an image with enhanced depth of field.
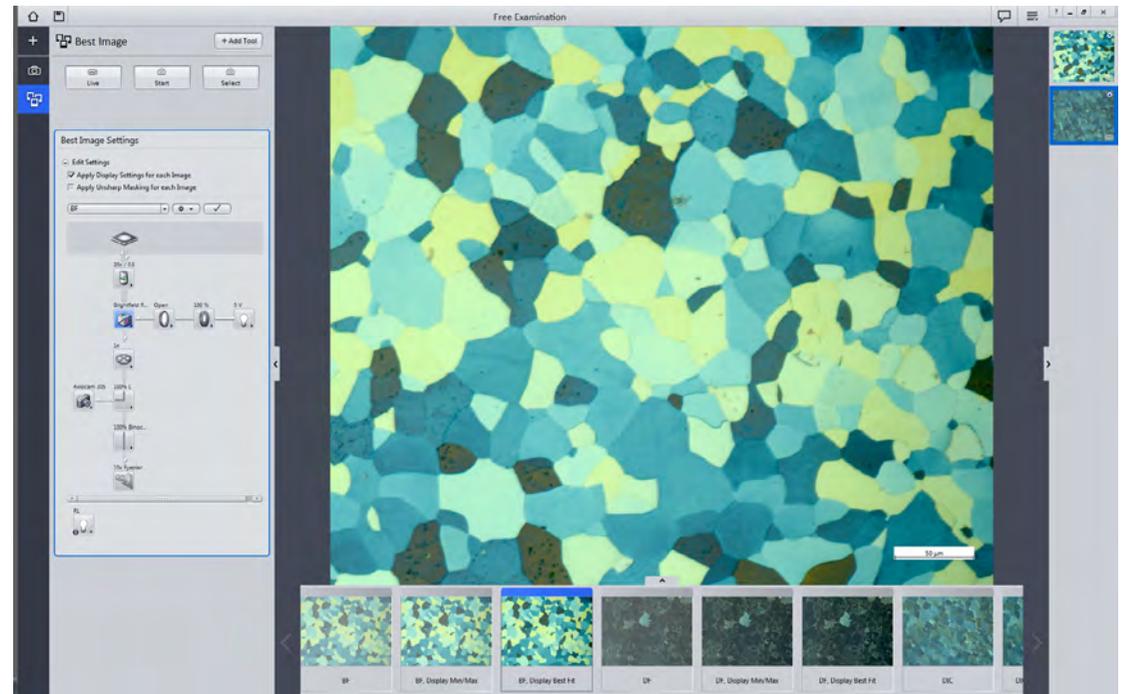
Best Image workbench generates several images by applying different microscope presets. The user can choose the best image.
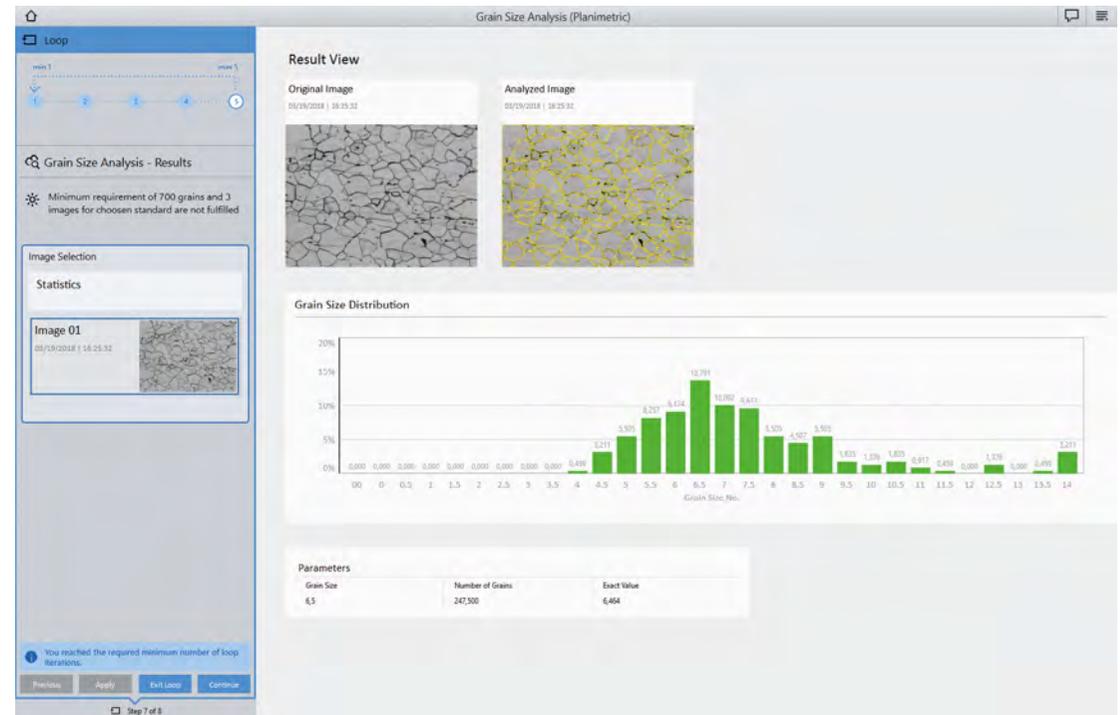
ZEISS ZEN 2 core at Work

Grain Size Analysis

■ The size and distribution of grains are directly linked to the material properties. Quantify the crystallographic structure of your materialographic samples in accordance to international standards. Three evaluation methods allow you to characterize your material:

■ **Planimetric method** for automatic grain boundary reconstruction
■ **Intercept method** with a variety of different chord patterns to interactively recognize and count the intersections with grain boundaries
■ **Comparison method** for manual image evaluation with comparative diagrams

Supported Standards:
■ DIN EN ISO 643:2012
■ ASTM E 112-13
■ ASTM E 1382-97
■ GB/T 6394 2002 Plate I-V

*Planimetric Grain Size Analysis – result view*

ZEISS ZEN 2 core at Work

Multiphase Analysis

Any part of the material with a distinct crystal structure can be taken as a "phase". Different phases are separated from one another by distinct boundaries. Distribution and orientation of phases affect the material properties like hardness, strength or elongation at break.

Analyze the phase distribution in your samples. Determine size, shape or orientation precisely and fully automatically. Use this distribution analysis to gain information about porosity of additive manufactured material.
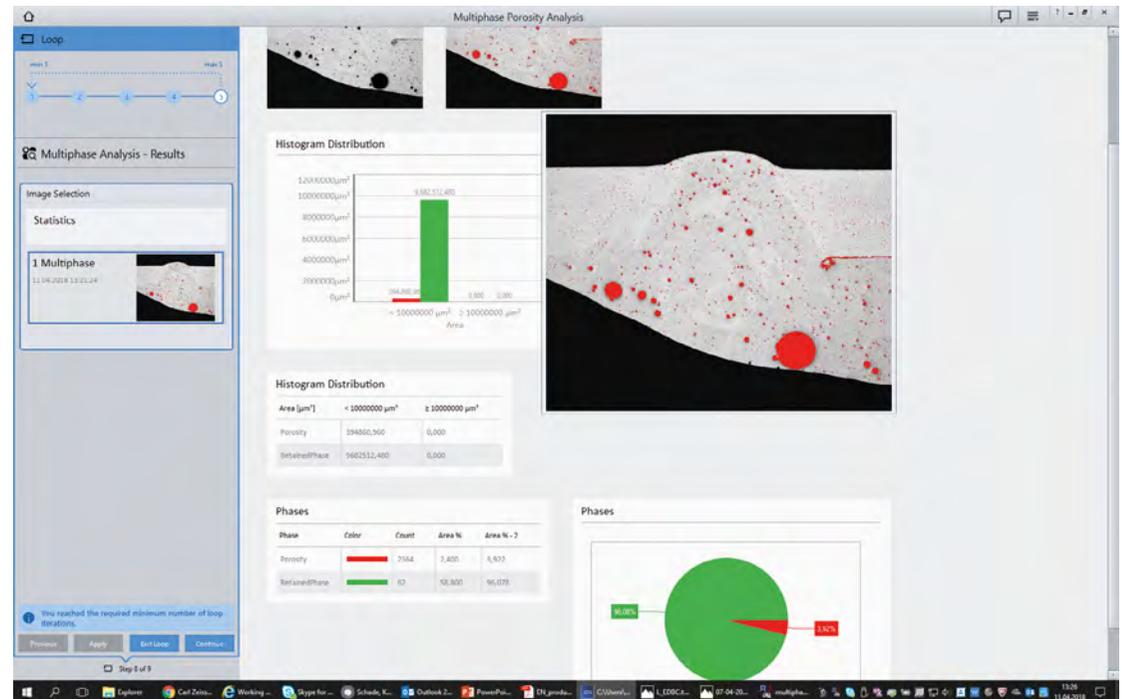
Multiphase Analysis – result view with distribution of different phases

ZEISS ZEN 2 core at Work

Cast Iron Analysis

Depending on process parameters and chemical composition of the material, graphite particles in cast iron can occur in different shape and distribution. This influences the mechanical properties of the material.

Analyze the shape and size of graphite particles fully automatically. Obtain the spheroid number according to EN ISO 945-1: 2008 + Cor. 1:2010. Determine the nodularity of vermicular graphite and examine the content of graphite particles in area percentage.
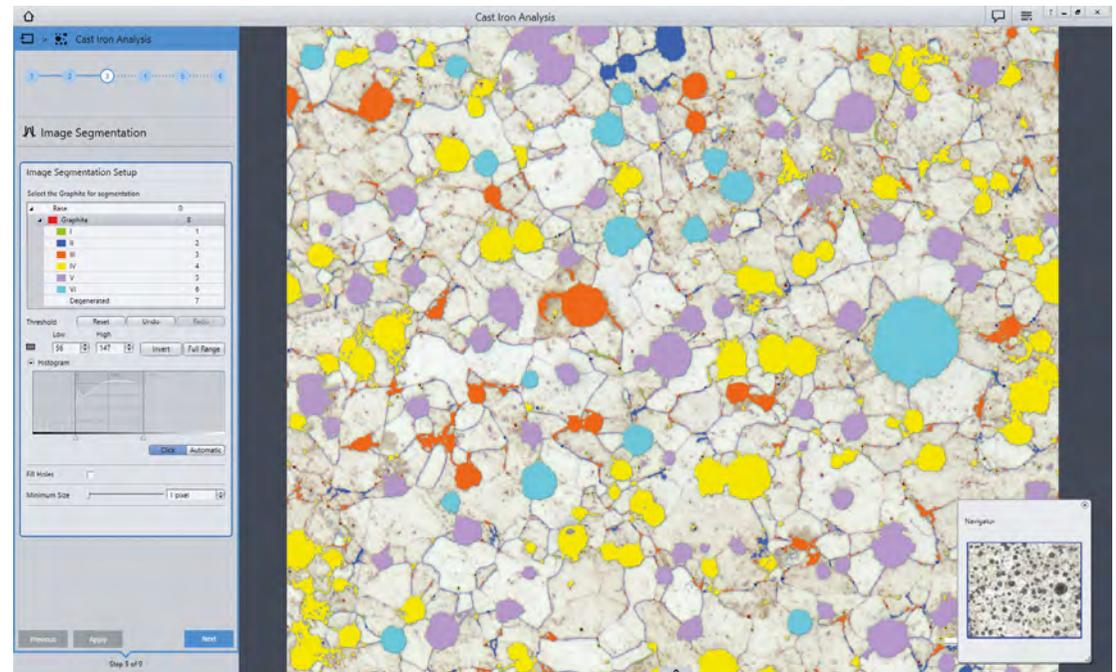
Cast Iron Analysis – image segmentation step

ZEISS ZEN 2 core at Work

Comparative Diagrams

Make your Wall Charts digital. Compare your sample under the microscope with comparative diagrams directly on your screen. Choose between different schematic micrographs with specific characteristics. These change gradually from image to image and may relate to grain size, carbide precipitation in steel, or quality of sample preparation. The module also provides a chart series creator to design your own comparison diagrams, e.g. for pass-/fail criteria in quality control or best target preparation images for your individual material microstructures.
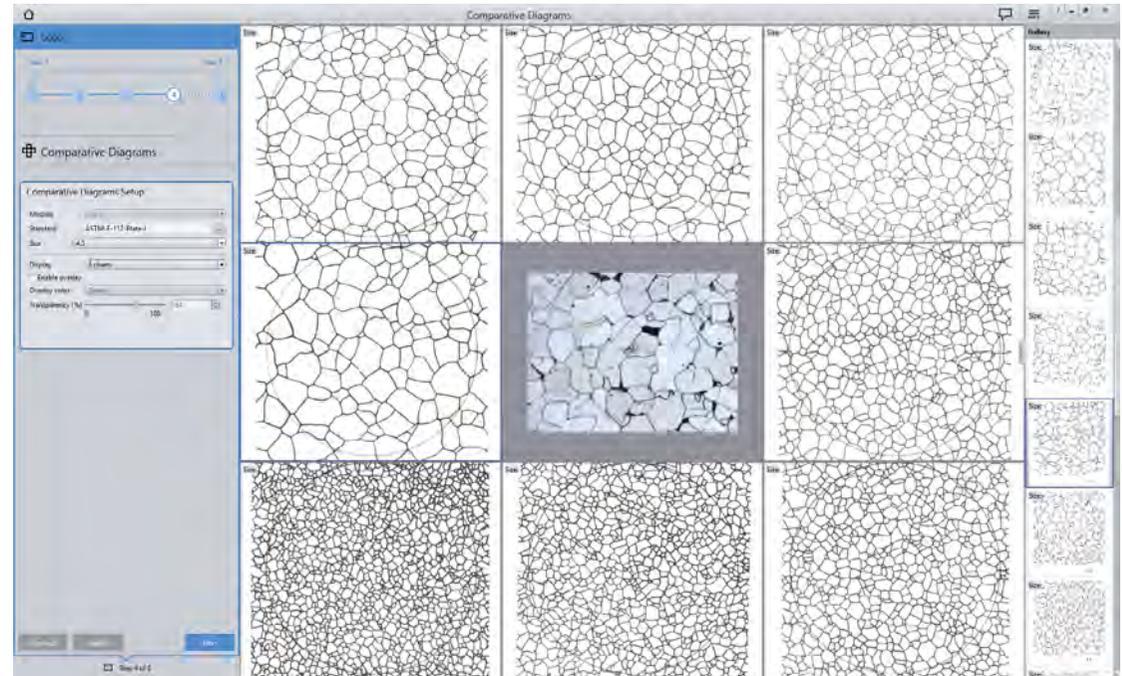
Comparative Diagrams – compare the sample with standardized or customized wall charts

Supported Standards

Grains:
DIN EN ISO 643:2012
ASTM E 112-13 Plate I-IV
GB/T 6394 2002 Plate I-IV

Graphite:
EN ISO 945-1: 2008 + Cor. 1: 2010

Non-metallic inclusion (NMI):
ISO 4967:2013
GB-10561
EN 10247:2007
ASTM E 45:2013
DIN 50602:1987

ZEISS ZEN 2 core at Work

Layer Thickness
Measure thickness of coatings and platings, or the depth of hardened surfaces in the cross section of a sample.

Evaluate complex layers systems either automatically or interactively. The module calculates the course of the measurement chords depending on the gradient present.

Get the results from your part in a clearly report containing images, sample data and measurement values, such as the maximum and minimum chord lengths, mean, and standard deviation.
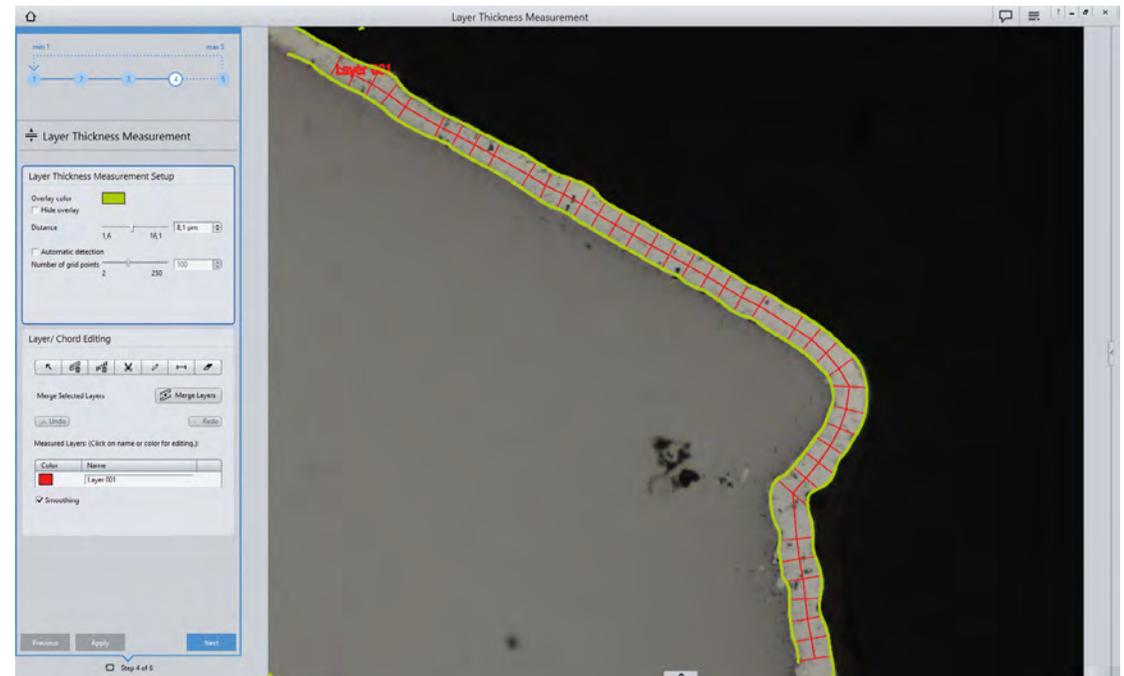
Layer Thickness – automatic detection of a layer

ZEISS ZEN 2 core at Work

GxP Module

The GxP module enables traceable workflows through seamlessly integrated microscopy hardware and software to meet the requirements of regulated industries. Every workflow available in ZEN 2 core can be made GxP compliant. The GxP module helps:

- **Quality Managers** who want to guarantee reproducible results and secured processes
- **Validation Engineers** who want to be able to validate their microscopy processes
- **Lab Managers** who need to document their microscopy processes
- **IT Managers** who need backup/disaster recovery functionality, and archive/database capability
- **Pharmaceutical Companies** who need to be compliant to e.g. FDA 21 CFR Part 11

Audit Trail of all user activities

Use a variety of tools and functionalities in combination with the required qualification and validation activities to maintain GxP compliance for your images, tables, and reports:

User management
- Audit trail
- Release procedure of workflows
- Electronic signatures, incl. countersign functionality
- Checksum protection of process-critical data
- Disaster recovery
- Combination of different clients via database

ZEISS ZEN 2 core at Work

Archive

The Archive is the storage location for all the results and templates generated with ZEN 2 core. Easily browse and access all results, even those generated from multiple instruments operated via ZEN 2 core. Single station installations can be seamlessly upgraded to multi-station/multi-user database environments.

- Access data collected from individual systems or from multi-modal workflows
- Central storage of results and templates across systems, laboratories and locations
- Upgradable to database and multi-user systems
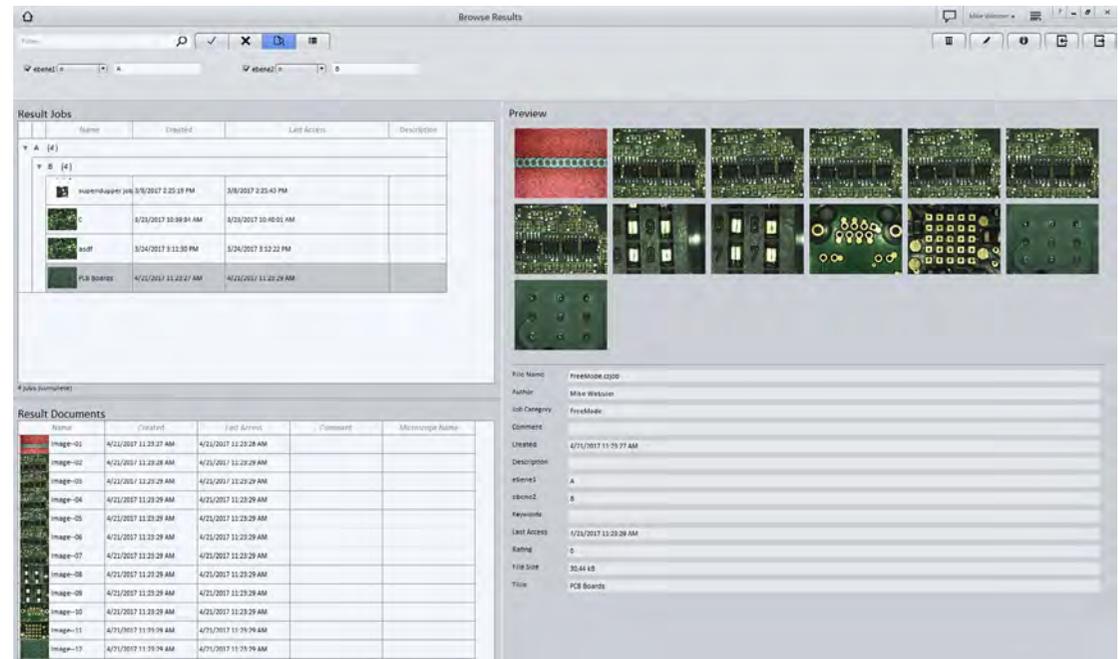
Filtering and managing your results in the browse result view of ZEN 2 core

ZEISS ZEN 2 core at Work

Shuttle & Find

Correlative microscopy is a powerful technique for combining the complementary attributes of different microscopic techniques to obtain maximum meaningful information from parts or materials samples. Shuttle & Find is the ZEISS correlative microscopy interface, designed specifically for use in materials analysis and industrial QA. Seamlessly transfer samples between different light and/or electron microscopes, then quickly and automatically relocate regions of interest to collect maximum relevant data with minimal effort. Shuttle & Find also features functionality for multi-modal data overlay, and keeps data from multiple modalities together in a single data folder, ensuring the integrity of data collected in such workflows.

With Shuttle & Find, you can:
- Transfer samples between ZEISS light and electron microscope systems faster than ever
- Relocate regions of interest automatically
- Improve efficiency and throughput
- Collect the maximum relevant information
- Make well informed material decisions
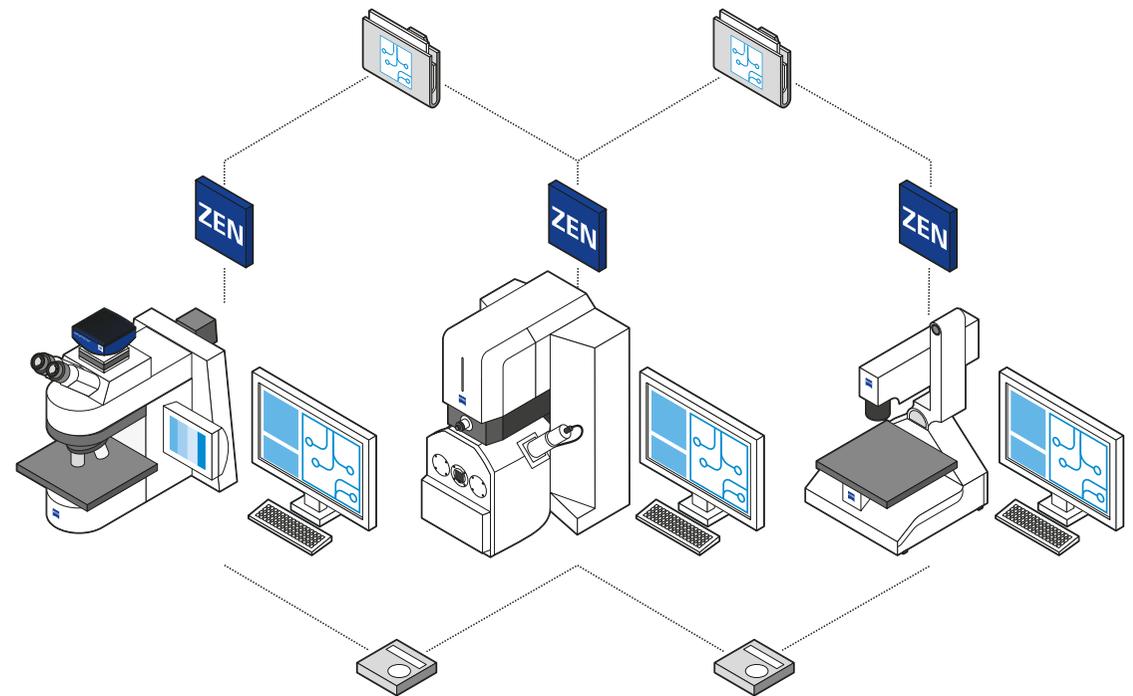
Shuttle & Find sample holder

▶ Click here to view this video

Shuttle & Find: Get more information from light and electron microscopy – together

ZEISS ZEN 2 core at Work

IMAGIC IMS – Access Images Everywhere

The unique client-server architecture of IMAGIC IMS enables centralized storage and handling of images captured across world-wide locations. Based on your individual requirements, you choose from a wide range of available server modules such as:

- **LIMS Interface**
  Automated work synchronization with your internal order management

- **LDAP User Management**
  Data and function access right management for groups and individuals across the entire network

- **SOLR-Search**
  Internet-like quick search for fast and easy retrieval of all image-related data in the blink of an eye

- **Additional IMS Server modules**
  Audit Trail, Long-Term Archiving, Watermarking, Excel Data Import/Export, Database Synchronizing, IMS Server Cluster, IMS Oracle

IMAGIC IMS – Reporting and Publishing

For easy publishing and sharing of your images: IMAGIC IMS Reporting

- **IMS Word® or PowerPoint® Modules**
  Let you create reports and presentations, based on your individual templates, with just a few clicks.

- **IMS Publisher**
  The Web browser-based publisher allows instant and world-wide access to images and meta data for selected recipients via safe web links for visualization and download.

*LIMS: Labor Informations Management System
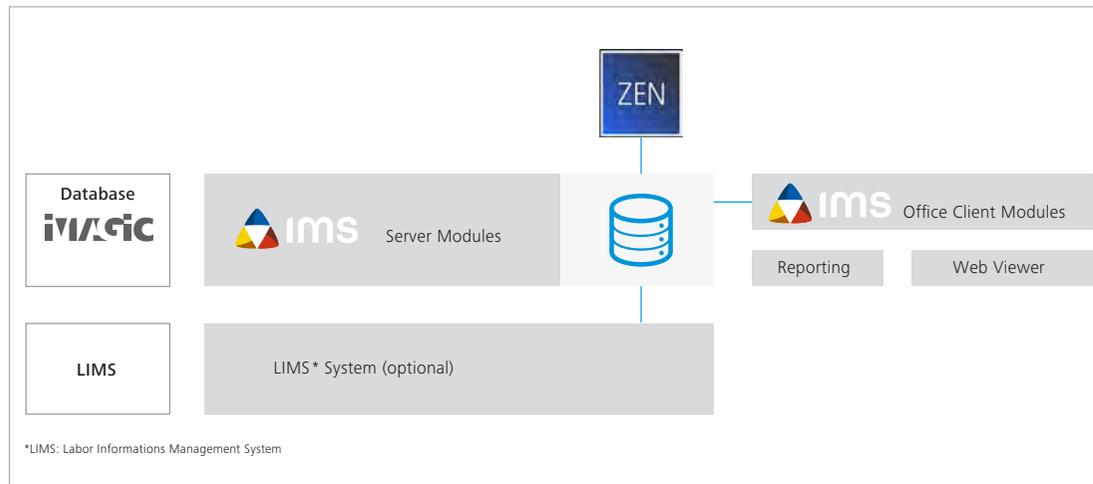
IMS Publisher for web-based viewing and download

Your Flexible Choice of Components

Select Your Modules According to Your Requirements

Generic Functions	ZEN 2 starter	ZEN 2 core	Description
Microscope Control		●	Control of microscope and devices from software
Camera Control	●	●	Control of the camera out of the software
Workbenches	Generic workbenches	Workbenches depending on functional modules	Depending on the functionality and modules, the respective workbenches are available
Basic Measurement	●	●	Basic functions for interactive measurement
Database Interface	●	●	Basic interface for storing data in databases
Reporting	●	●	Creation of reports containing detailed information
Report Template Creator (MS Word® Add-In)	●	●	Software to create report templates using MS Word®
CAD Import		●	Import CAD data to create overlay images

Functional Modules	ZEN 2 starter	ZEN 2 core	Description
Manual Extended Focus	●	●	Manually acquire multiple images at different focus positions and combine them to an image with a greater depth of field
Panorama	●	●	Manual acquisition of high resolution images; automated acquisition and stitching functionality on coded and non-coded stages
Measurement	○	●	Extended functionality of interactive measurement
Online Measurement	○	○	Measurement of areas and non-area values in the live image
Image Analysis	○	○	Creation of automatic measurement programs
Motorized Extended Focus		○	Automatically acquire multiple images at different focus positions and combine them to create an image with a greater depth of field
Advanced Processing & Analysis		○	Add hierarchical measurements and more processing to your image analysis
Tiles & Positions		○	Record exact, highly resolved images of large samples by automatically scanning pre-defined areas
Autofocus		○	Determine the focus position of your sample
Data Management[1]	○	○	Interface module to seamlessly connect to Imagic Database Server
Linkam (Hardware Control)		○	Interface to control Linkam heating- and cooling stages
Macro Environment		○	Use Python programming language to generate customer specific macros
Shuttle & Find		○	Correlative Microscopy Module Shuttle & Find for image acquisition and correlation on light and electron microscopes.
GxP		○	Audit Trail and process insurance. Precondition to create a 21 CFR Part 11 compliant system.

● Included ○ Optional

[1] Only available in specific countries

Your Flexible Choice of Components

Generic Functions	ZEN 2 starter	ZEN 2 core	Description
Grain Size Analysis		O	Determine grain sizes in three different methods according to international standards
Cast Iron Analysis		O	Analyze form, size and distribution of graphite particles in cast iron
Multiphase Analysis		O	Automatic measurement of particle size and area content of multiphase samples, also evaluation of porosity
Comparative Diagrams		O	Compare micrographs with standardized or customizable comparative charts (Wall Charts)
Layer Thickness		O	Automatic or interactive thickness measurement of different layer

● Included   O Optional

Technical Specifications

Minimum System Requirements

ZEN 2 starter	ZEN 2 core
Intel® Core i5-4670 3.0 GHz	Intel® Xeon E5-2643 3.0 GHz
Intel® Q87 chipset	Intel® C602 chipset
8 GB DDR3-RAM	16 GB DDR3-RAM
Graphics adapter with 1920 × 1200 resolution, 32-bit true color, 128 MB RAM, DirectX 8.0 or higher	Graphics adapter with 2560 × 1600 resolution, 32 Bit true color, DirectX 8.0 or higher
Monitor 20" TFT, vertical resolution 1200 pixels at least	Monitor 24" TFT 1600 × 1200
Harddrive 250 GB Serial ATA 3.0 Gbit/s	Harddrive 1 × 128 GB SSD and 2 × 2 TB Serial ATA 3.0 Gbit/s (configured as 2 TB RAID 1)
1× FireWire IEEE 1394a for connecting a FireWire Axiocam camera	2 available PCI Express x8 Gen2 slots for camera interface cards
1× FireWire IEEE 1394a interface	1× FireWire IEEE 1394a interface
	2× serial interfaces (COM1 and COM2)
2× USB 2.0, 2× USB 3.0 interfaces	4× USB 2.0, 2× USB 3.0 interfaces

Supported Operating Systems

ZEN 2 starter	ZEN 2 core
Microsoft Windows® 7 Ultimate 64-bit	Microsoft Windows® 7 Ultimate 64-bit
Microsoft Windows® 7 Professional 64-bit	Microsoft Windows® 7 Professional 64-bit
Microsoft Windows® 7 Enterprise 64-bit	Microsoft Windows® 7 Enterprise 64-bit
Microsoft Windows® 10 Pro 64-bit	Microsoft Windows® 10 Pro 64-bit
Microsoft Windows® 10 Enterprise 64-bit	Microsoft Windows® 10 Enterprise 64-bit

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