



Product Information  
Version 2.1

## **ZEISS Smartzoom 5**

Sampling Made Simple: Your Automated Digital Microscope  
for Routine and Failure Analyses



## Smart Design. Smart Workflow. Smart Output.

- › **In Brief**

- › The Advantages

- › The Applications

- › The System

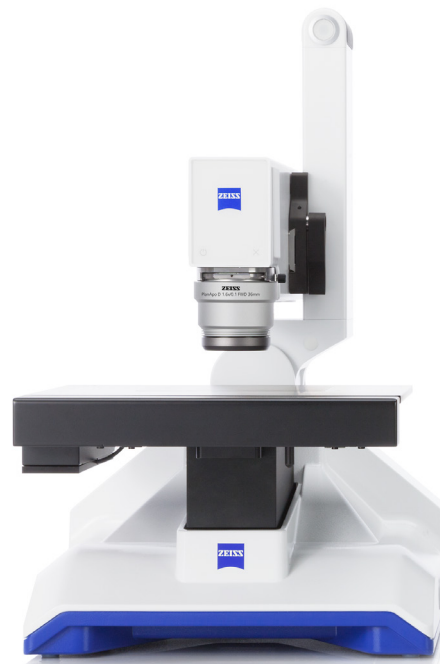
- › Technology and Details

- › Service

Industrial microscopy from ZEISS stands for superior optical quality and top performance. And for intelligence you can put to work.

Case in point: Smartzoom 5, the smart digital microscope that's ideal for quality assurance applications in virtually every field of industry. Quick and easy to set up, fully automated, and equipped with dedicated quality assurance and quality control components, it's so simple to operate, even untrained users will produce excellent results.

With Smartzoom 5, ZEISS puts the **IQ** into **Industrial Quality**.



# Simpler. More Intelligent. More Integrated.

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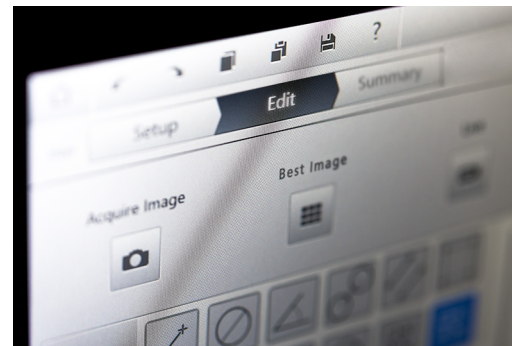
## Smart Design.

Smartzoom 5 incorporates highly intelligent quality assurance and quality control analysis (QA/QC) technologies as standard features. How intelligent? Take its unique, dedicated QA/QC hardware design. Smartzoom 5 comes with a number of integrated components. Have a look at the optical engine, for example, which combines three functions – zoom, overview camera, and coaxial illumination – in a single component. All this in a lightweight, portable system that's easy to assemble and set up – no expert knowledge or tools required. Your Smartzoom 5 always knows the status of all major components and corrects automatically for component variations. That's smart design.



## Smart Workflow.

Smartzoom 5 is equipped with a series of smart functions and workflow-oriented software, making it incredibly easy to put work through. How easy? It features an extraordinary macro recording and learning mode to enhance the workflow for repeat sample analyses of the same type in a step by step manner. The integrated QA/QC graphic user interface combines with gesture control to support a seamless macro-to-detail workflow, allowing easy navigation at all times. Features such as these make Smartzoom 5 a user-friendly system to work with, even for untrained personnel. Image presets and enhancement help you get the best image. A number of image algorithms enable automatic measurements. That's smart workflow.



## Smart Output.

Smartzoom 5 is the essence of reliability, delivering fast, reproducible QA/QC measurements for routine as well as failure analyses tasks. How reliable? The system's guided workflow in combination with calibrated components supports user-independent measurement results. And that's just the beginning. The system is fitted out with several fully automatic functions designed to enable fast, highly reliable analyses while enhancing overall productivity. That means Smartzoom 5 gives you the confidence that comes from knowing the quality of what you are producing at all times. Simply annotate your images and export reports to word templates. That's smart output.



# Your Insight into the Technology Behind It

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## That's Smart Design.

Smartzoom 5 brings you a number of cleverly integrated components. Cables are minimized and completely housed inside the system to eliminate clutter. The optical engine is the heart of the system, combining zoom, overview camera and coaxial illumination – three functions in a single component. Just one minute – that's all you need to assemble the system, and you don't need expert knowledge or specialized tools either.

With Smartzoom 5, you have a choice of three different objectives of varying magnifications ranging from 10x to 1,011x.\* All three contain a bayonet mount that can be powered electrically, meaning you benefit from rapid objective changes and the objectives' electrical connectivity. The segmentable LED ringlight integrated into the objectives is powered via the contacts, and the geometrical correction values are accessed individually from the objectives. Not to be taken lightly: its smart safety features. For instance, if the objective touches the sample or your hand, the motor stops automatically, protecting both user and sample.

\* with respect to a 17.5" monitor

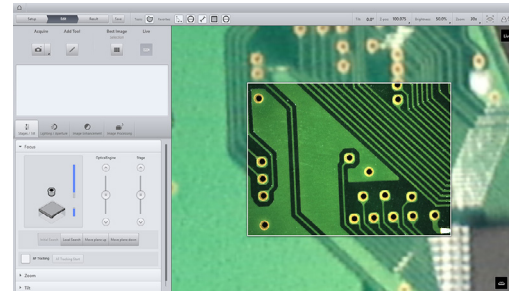


# Your Insight into the Technology Behind It

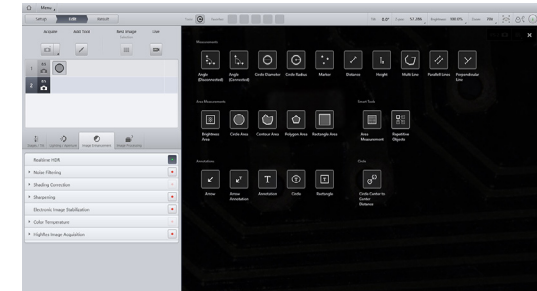
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## That's Smart Workflow.

Orientation is always simple with Smartzoom 5's integrated QA/QC graphic user interface supporting a seamless macro-to-detail workflow. As a result, the entire sample surface is recorded with separate optics. You can see instantly which areas of your samples are relevant for microscopic inspection. Then move to those positions using gestures either on the touch monitor or the controller. You can also set up a coordinate system to use for carrying out subsequent examinations of components. The images you record and the tools you use are displayed in a clearly arranged manner so you can get an overview of your entire inspection workflow at a glance. In addition, the entire workflow is neatly stored away, ready to perform the microscopic analysis again and again – step by step. With its auto-feature detection, Smartzoom 5 automatically recognizes and measures samples based on parameters you have predefined. For optimal presentation simply choose from preview images using best image or live image enhancement functions such as HDR, noise filtering, sharpening, and stabilization.



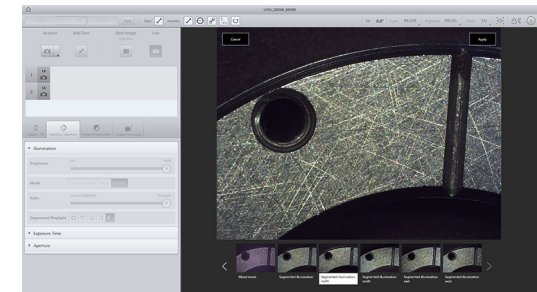
*Thanks to the overview image you always know your position on the sample.*



*All tools are clearly laid out; you can easily choose your five favorites.*



*Profit from easy, smartphone-like user interaction.*



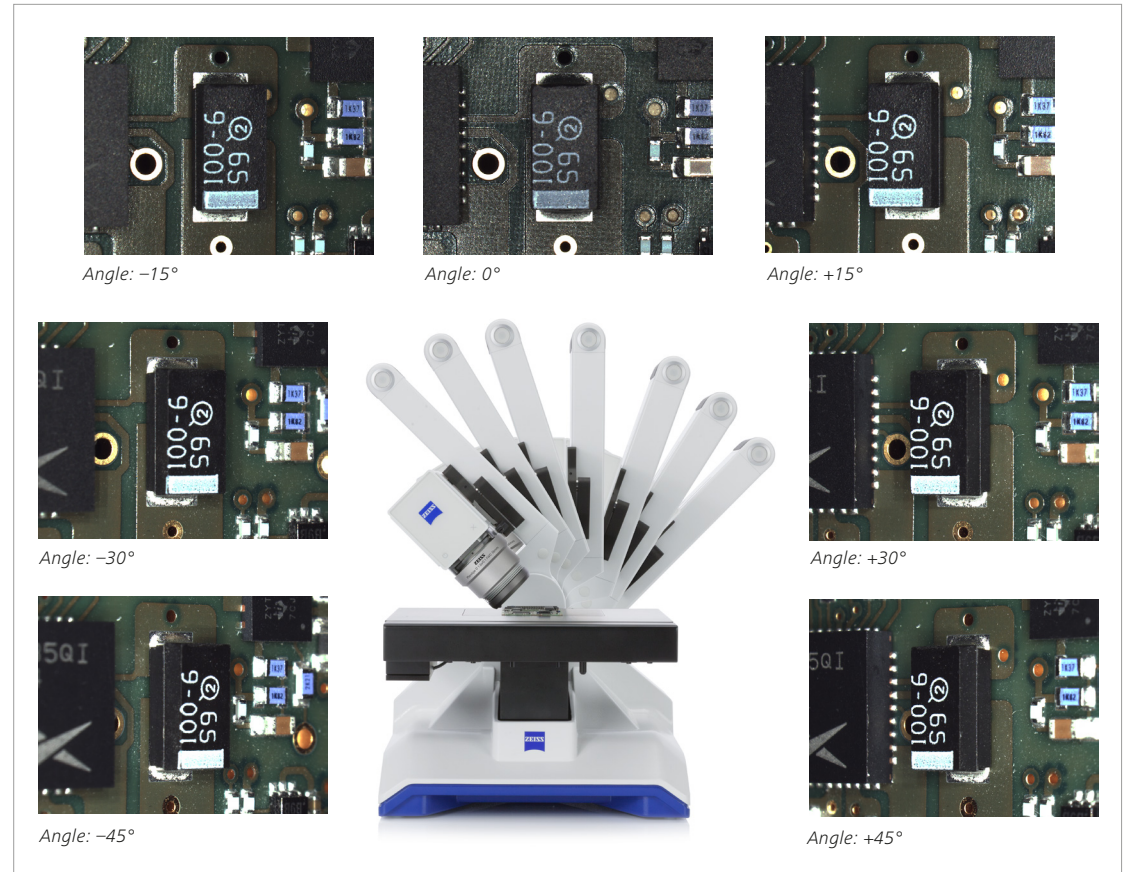
*With the image presets you can choose the setting which displays your sample in the best possible way.*

# Your Insight into the Technology Behind It

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## That's Smart Output.

As regards the tilting angle and the objectives, all Smartzoom 5 components are either encoded or motorized. Thus, the software continuously monitors the status of each component and stores the information together with the imaging data. Smartzoom 5 also features a user management system that ensures reproducibility by restricting the adjustments individual operators can make. Annotate your images and export reports effortlessly to word templates.



With the microscope's swing arm you can view structures on the sample surface from continuously adjustable angles between  $-45^\circ$  and  $+45^\circ$ . As you do so, the pivot point of the swivel axis remains stable, and likewise the focus remains squarely on your sample.

# Expand Your Possibilities

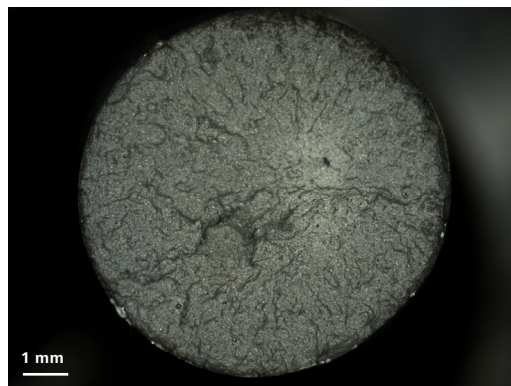
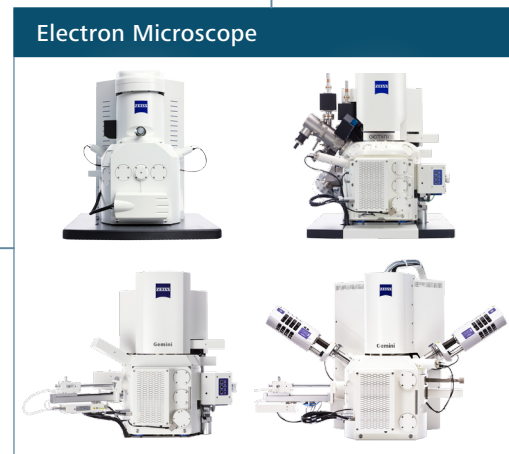
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## Shuttle & Find between your ZEISS digital and electron microscopes.

Make the most of the industry largest microscopy portfolio. Extract more value from your ZEISS digital, light and electron microscopes.

With Shuttle & Find you easily relocate regions of interest from light microscopy to electron microscopy, and vice versa.

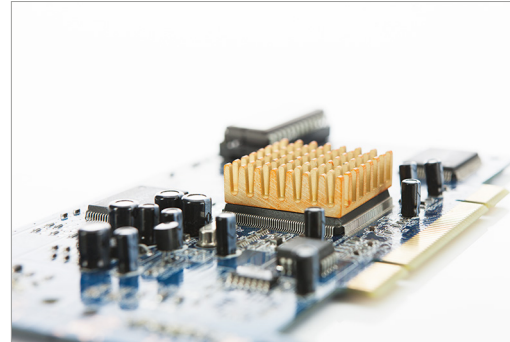
### ZEISS Shuttle & Find



# Tailored Precisely to Your Applications

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Typical Applications, Typical Samples	Task	ZEISS Smartzoom 5 Offers
<b>Automotive Industry</b>	Working with structures having different contrasts and small pits and/or bumps.	The switchable ringlight lets you view these pits and bumps in the best possible way. Then use HDR to compensate for contrast differences and intensity variations.
<b>Electronics Industry</b>	Analyzing individual components within the overall context of a component assembly. Your samples exhibit significant height differences, yet you want to capture everything in sharp images.	With its integrated overview camera and relative coordinate system, Smartzoom 5 places your microscopic analysis in the overall context of the sample. EDF brings significant height differences into focus.
<b>Metal Industry</b>	Comparing the two-dimensional shape of machined components to their respective specifications. Analyzing identical parts more than once.	An extensive set of 2D measuring tools give you the ideal means for analyzing parts. Teachable jobs enable repetitive analyses.
<b>Medical Device Industry</b>	Examining three-dimensional metal components such as stents or molded plastic parts for defects or specification deviations.	Smartzoom 5 makes true-to-life reconstruction and measurement of your part in 3D possible.

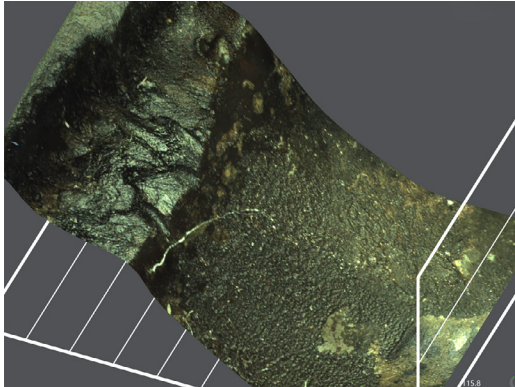




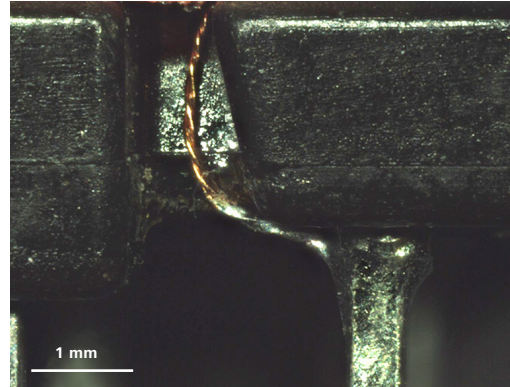
# ZEISS Smartzoom 5 at Work

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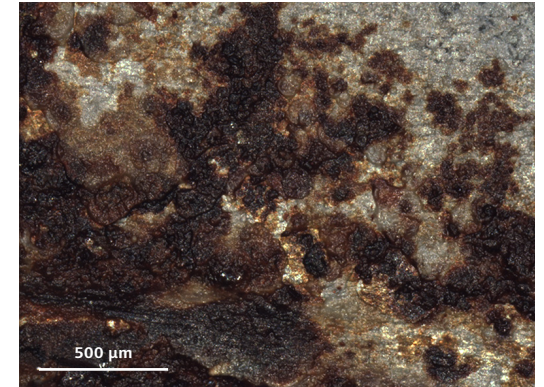
## Automotive



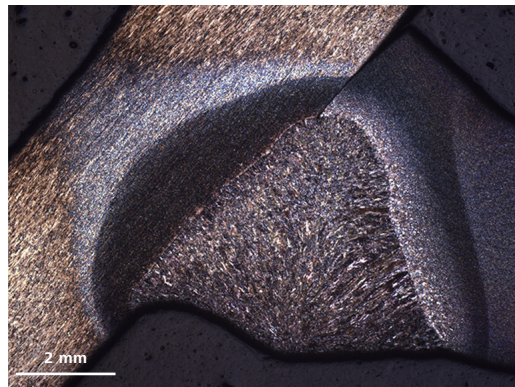
Exhaust residues on outlet valve, segmented ringlight illumination, extended depth of field (EDF), objective: 1.6x, magnification: 45x



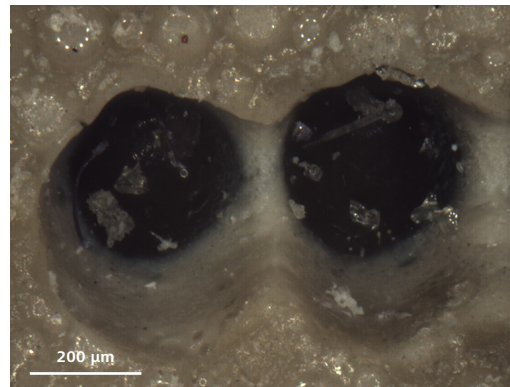
Coil wire soldered to contact pin, segmented ringlight illumination, extended depth of field (EDF), objective: 1.6x, magnification: 80x



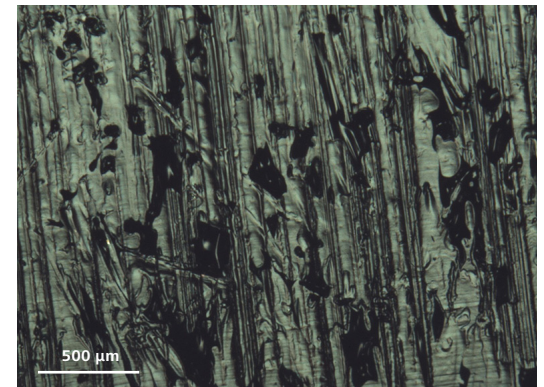
Corrosion of auto body, full ringlight illumination, extended depth of field (EDF), objective: 1.6x, magnification: 87x



Laser weld, coaxial brightfield illumination, objective: 1.6x, magnification: 32x



Laser shots in air bag cover, full ringlight illumination, extended depth of field (EDF), objective: 1.6x, magnification: 259x

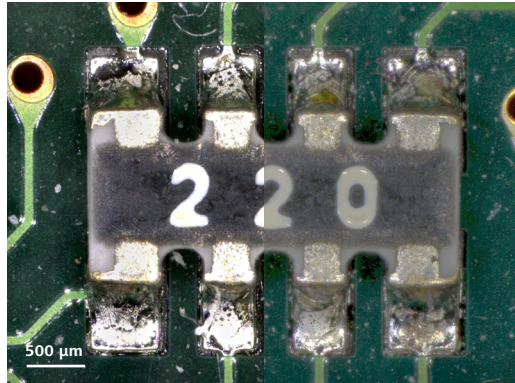


Voids on surface of gas tank lid, coaxial brightfield illumination, objective: 5x, magnification: 150x

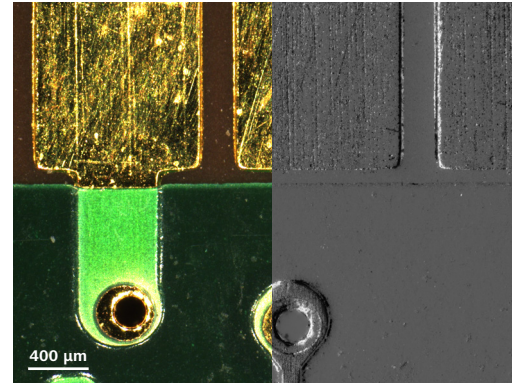
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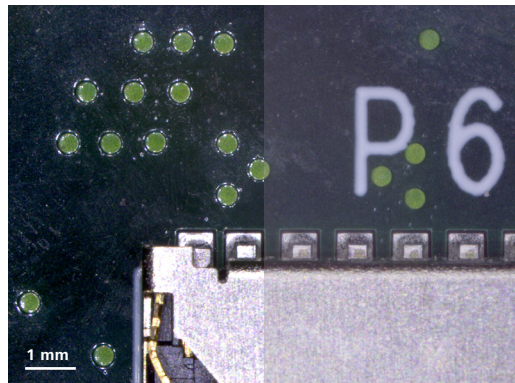
## Electronics



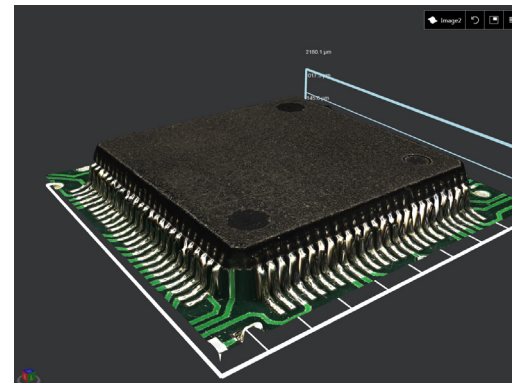
Surface Mounted Device (SMD) acquired without (left) and with (right) realtime HDR imaging, objective: 1.6x, magnification 80x, ringlight illumination



Contact pads on PCB recorded with ringlight illumination (left) and digital contrast (right), objective: 1.6x, magnification 109x, ringlight illumination



Printed circuit board (PCB), left: no glare removal, right: ringlight and glare removal mode, objective: 0.5x, magnification: 35x



Mounted chip recorded with 3D and stitching acquisition, objective: 1.6x, magnification 72x, ringlight illumination

# Your Flexible Choice of Components

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## 1 Microscope

ZEISS Smartzoom 5 (motorized)

Consisting of:

- Stand
- Optical engine
- Stage

## 2 Objectives

- PlanApo D 5x/0.3 FWD 30 mm (telecentric, suitable for coaxial reflected light and ringlight)
- PlanApo D 1.6x/0.1 FWD 36 mm (telecentric, suitable for coaxial reflected light and ringlight)
- PlanApo D 0.5/0.03 FWD 78 mm (suitable for ringlight)

## 3 Illumination

- Ringlight (integrated in the objectives)
- Coaxial reflected light (integrated in optical engine)

## 4 Cameras

- Overview camera (integrated in optical engine)
- Microscope camera (integrated in optical engine)

## 5 Computer System

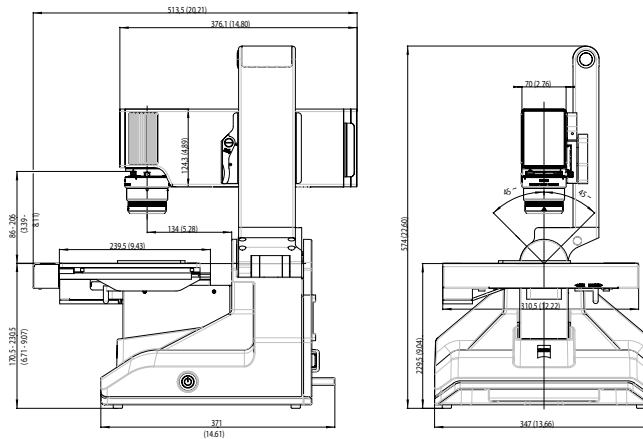
- All-in-One PC
- Smartzoom 5 software
- Controller

## 6 Accessories

- Transport case

# Technical Specifications

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## System Components

<b>Optical Unit</b>	Containing the camera, coaxial reflected light, 10× optical-motorized zoom, and overview camera.
<b>Objectives</b>	Connected to the optical unit via a bayonet mount. They contain switchable ringlight and storage module in which the exact magnification is saved.
<b>Stage</b>	Powered by a stepper motor with integrated controller which makes it possible to move in a reproducible manner to relevant areas of the sample.
<b>Stand</b>	Powered by a motorized z-drive for focusing and a swing arm to adjust the viewing angle in relation to the surface of the sample. In addition, the stand contains a second motorized drive to correctly adjust the pivot point in relation to the sample height.
<b>Controller</b>	Comprising a dual rotary wheel for controlling zoom, focus, and stage movement; a touch pad for gesture controlling hardware and software; touch display for operating software features; and detachable wireless keyboard.
<b>All-in-One PC</b>	Containing the Smartzoom 5 application software and connected to the controller via USB 2 and to the stand via USB 3.

## Technical Data

<b>Maximum Resolution</b>	~ 1 μm
<b>Maximum Magnification</b>	1,011× (with respect to a 17.5" display diagonal and an aspect ratio of 4:3)
<b>FWD at Maximum Magnification</b>	30 mm
<b>FOV at Minimum Magnification</b>	40 mm
<b>Camera</b>	Sensor type: CMOS
	Sensor size: 1", 4.2 megapixel
	Total pixels: 2,048 × 2,048
	Available pixels: 1,920 × 1,440
	Effective pixels: 1,600 × 1,200

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Technical Data	
Image Resolution	Standard: 2.1 megapixel
	True RGB: 2.1 megapixel
	High definition: 18 megapixel
Image Format	.czi
	Export: .czi, .jpg, .tif, .png
Frame Rate Live Image	Up to 30 fps
Optical Zoom	Zoom factor: 10x
	Zoom range: 0.5x to 5.0x
Objectives Data	PlanApo D 0.5x/0.03    FWD 78 mm
	PlanApo D 1.6x/0.1    FWD 36 mm
	PlanApo D 5.0x/0.3    FWD 30 mm
Motorized Stage	Travel (x/y): 130 × 100 mm
	Travel (z): ~60 mm
	Maximum load: 4 kg
	Reproducibility: ±1 µm
	Absolute accuracy: ±5 µm
Stand	Tilting angle (encoded): ±45°
	Maximum sample height: ~120 mm
	Reproducibility: ±1 µm
	Absolute accuracy: ±10 µm
	Passive vibration absorption
Illumination	Coaxial LED reflected light
	LED ringlight with 4 individual selectable segments
	Mixed illumination: coaxial and ringlight (brightness and ratio adjustable)
All-in-One PC	Operating system: Windows 10
	Monitor size: 21.5"
	Resolution in pixels: 1,920 × 1,080
Weight	~22 kg (system without PC)
	~30 kg (entire system)

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Software Concept	
User Level	Administrator
	Operator
Software Modes	Routine examination
	Free examination
Operating System	Windows 8.1, 64 bit; Windows 10
Magnification Calibration	Factory calibration
	Manual calibration
Units	Metrical (nm, $\mu$ m, mm)
	Imperial (nm, mil, inch)
White Balance	Factory default
	Manual white balance
Software Features	
Image Acquisition	2D
	EDF (Extended Depth of Field)
	3D (method depth of focus 3D reconstruction)
	Stitching (ad hoc, area), stitching + EDF, stitching + 3D
	Best image functionality
	Times series
	Relief display
	Digital contrast
Acquisition Mode	Auto exposure / manual exposure
	Aperture control
Workflow Features	Overview image: microscopic image is displayed in context of overview image for easy navigation
	Coordinate system for position tracking of recurring parts
	Tilting workflow (automatic pivot point)
	Workflow covers inspection tasks in their entirety
	Shuttle & Find Calibration Workflow (optional)

# Technical Specifications

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Software Features	
Image Enhancements	Realtime HDR
	Noise filtering
	Automatic shading correction
	Sharpening
	Image stabilization
	Brightness / Contrast
	High resolution image acquisition
Autofocus	Ringlight glare removal
	Global autofocus
	Local autofocus
3D Rendering Options	Autofocus tracking
	Wire frame
	EDF texture
	Height texture
2D Tools	z-scaling
	Annotations (arrow, circle, rectangle, text, scalebar)
	Measurement tools (distance, height, perpendicular line, parallel lines, multi line, connected angle, disconnected angle, contour, circle radius, circle diameter, circle-to-circle distance, reference point)
	Area tools (circle, rectangle, polygon, contour, brightness)
	Marker (count tool)
3D Tools	Shuttle & Find (points, region) (optional)
	Distance
	Profile (height, width, 3-point angle, 4-point angle, radius, diameter, distance, parallel lines, perpendicular lines, marker, multiline)
	Volume
Smart Tools	Angle
	Area measurement
	Repetitive objects (replicate tools on each object found)
Reporting	Golden sample comparison
	MS Word format
Languages	Multi language support
Optional Software	Shuttle & Find; ConfoMap

# Count on Service in the True Sense of the Word

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By choosing Smartzoom 5 from ZEISS, you've put reliability and availability among your top priorities for quality assurance and quality control.

## **Maintenance-Free Operation for Reliable Performance**

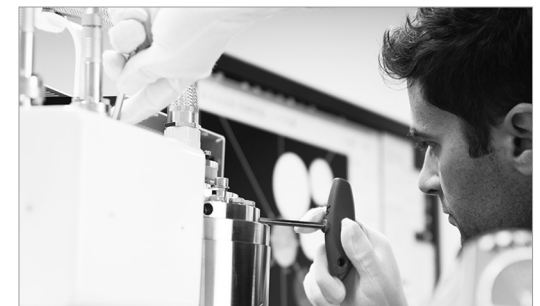
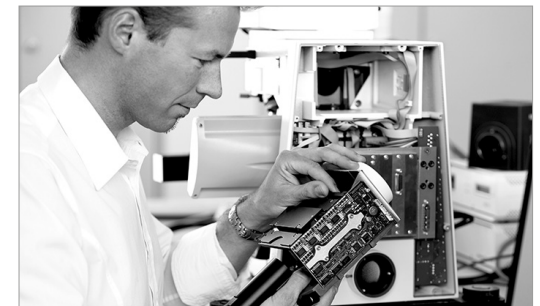
Because the ZEISS microscope system is one of your most important tools, we make sure it is always ready to perform. What's more, we'll see to it that you are employing all the options that get the best from your microscope. You can choose from a range of service products, each delivered by highly qualified ZEISS specialists who will support you long beyond the purchase of your system. Our aim is to enable you to experience those special moments that inspire your work.

## **Repair. Maintain. Optimize.**

Attain maximum uptime with your microscope. A ZEISS Protect Service Agreement lets you budget for operating costs, all the while reducing costly downtime and achieving the best results through the improved performance of your system. Choose from service agreements designed to give you a range of options and control levels. We'll work with you to select the service program that addresses your system needs and usage requirements, in line with your organization's standard practices. Our service on-demand also brings you distinct advantages. ZEISS service staff will analyze issues at hand and resolve them – whether using remote maintenance software or working on site.

## **Enhance Your Microscope System**

Your ZEISS microscope system is designed for a variety of updates: open interfaces allow you to maintain a high technological level at all times. As a result you'll work more efficiently now, while extending the productive lifetime of your microscope as new update possibilities come on stream.



*Profit from the optimized performance of your microscope system with services from ZEISS – now and for years to come.*

>> [www.zeiss.com/microservice](http://www.zeiss.com/microservice)





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