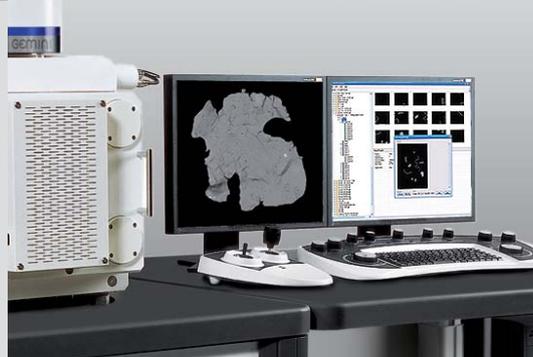
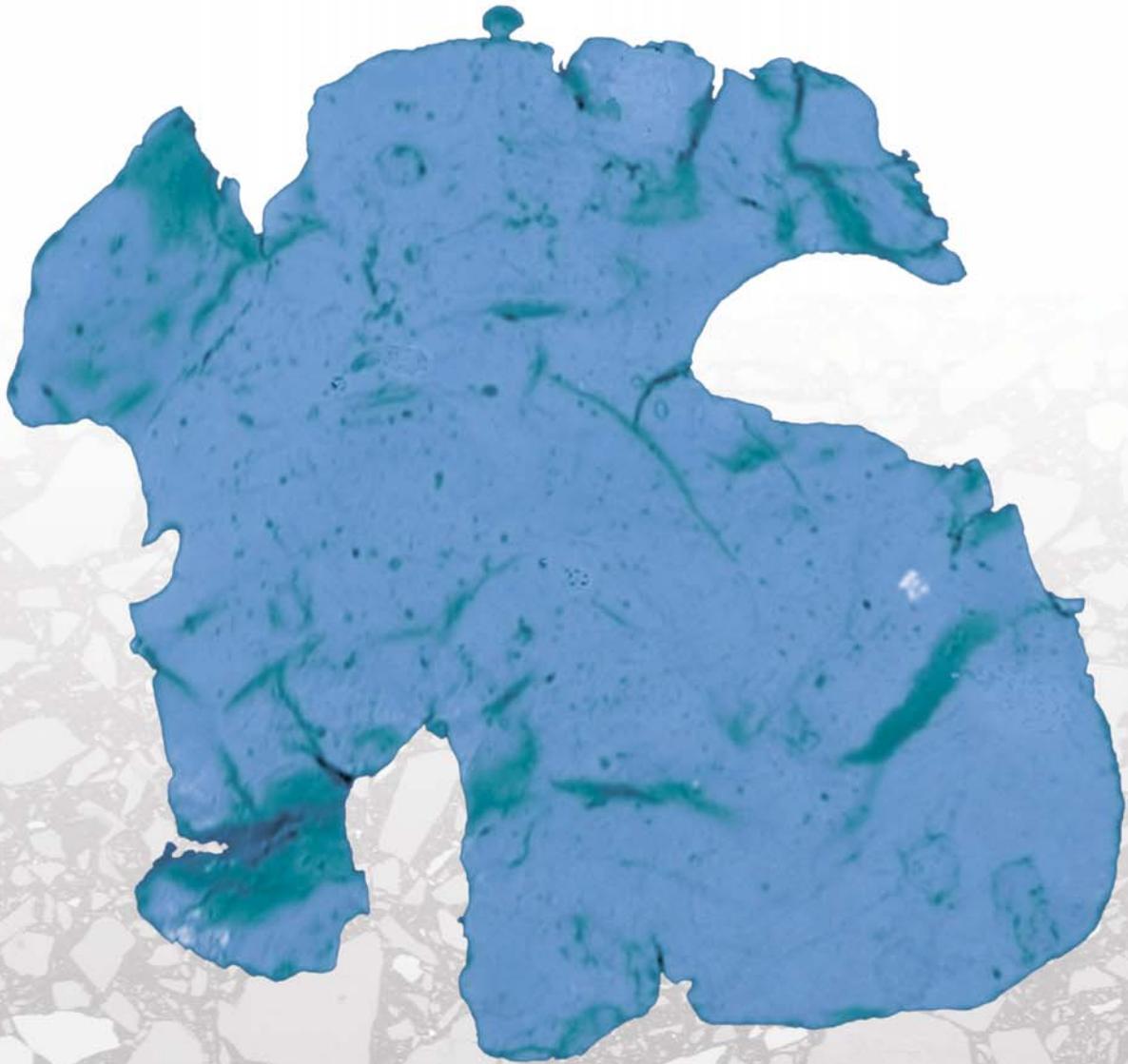


SmartPI™

The Complete Automated Particle Analysis Solution



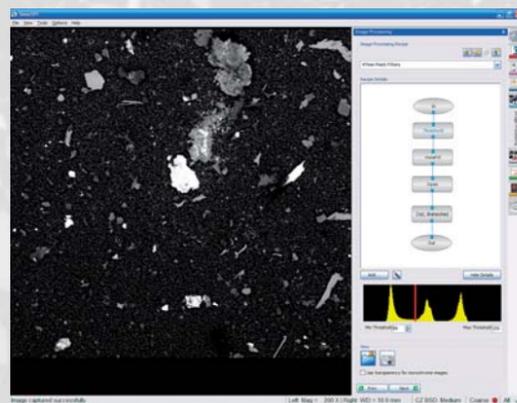
We make it visible.

SmartPI™

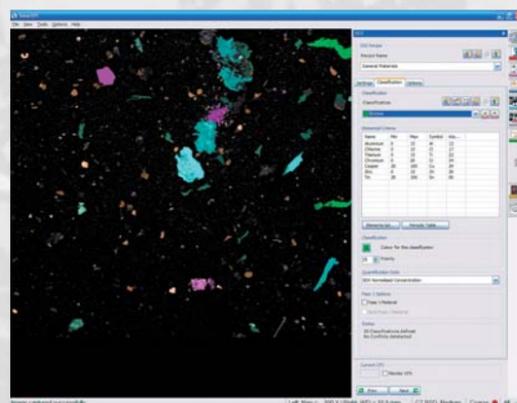
The Complete Automated Particle Analysis Solution

Smart Particle Investigator (SmartPI™) is a powerful particle analysis package for use with all conventional and field emission Scanning Electron Microscopes (SEM) from Carl Zeiss. It enables the automatic detection, investigation and characterisation of particles of interest.

SmartPI™ incorporates all aspects of the SEM control, image processing and Energy Dispersive Spectroscopy (EDS) analysis for particle detection and characterisation within a single application. SmartPI™ automates repetitive sample analysis to provide non-subjective results with minimal user involvement and enables continuous unattended operation of the instrument.



Automated detection of particles for advanced image processing.



Particle categorisation by elemental composition and morphological classification.

Ease of Use

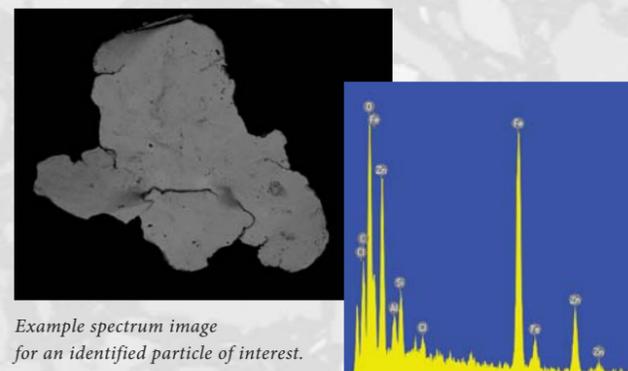
The automated nature of SmartPI™ dramatically simplifies daily operation such that an operator is only required to load the sample holder and initiate the predefined analysis routines (recipes). Total user configurability allows advanced operators to create or modify recipes to tailor the analysis routines to meet specific requirements. All recipes, system configuration and results data are stored in an auditable database for easy data review and export.

Auto-calibration Procedures

SmartPI™ performs self-diagnostic and auto-calibration routines before each auto-run and periodically during multi-sample runs, to ensure system stability and results accuracy. An auto-recovery process is initiated following an interruption in the auto-run, such as a filament failure.

Morphological & Chemical Classification

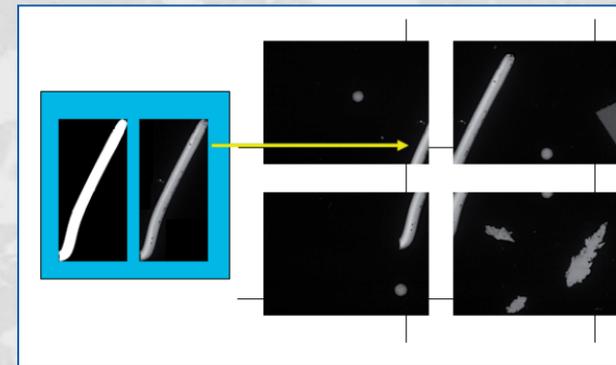
SmartPI™ employs advanced image processing and analysis techniques to measure a variety of morphological characteristics of each particle detected, for example feret max diameter and surface area. In addition, the chemical composition of each particle can be determined using EDS analysis. Each particle can be analysed rapidly using Spot Mode or in more detail using the advanced ZEISS Feature Scan Mode, which scans the complete particle shape to provide an accurate classification.



Example spectrum image for an identified particle of interest.

Border Particle Stitching

SmartPI™ incorporates a sophisticated border particle stitching algorithm which determines the full characteristics and measurements of an individual particle which crosses multiple fields. Images of stitched particles can easily be saved and reviewed.



Schematic of Border Particle Stitching feature showing composite stitched particle and constituent parts.

Advanced Stop Criteria

A range of advanced stop criteria allow the auto-run to end the analysis when a predefined threshold has been reached. Stop criteria can include analysis time, particle size, number of particles or fields counted, a specific classification, etc. This feature can be applied to single or multiple samples thereby significantly reducing the overall run-time. A live results window also allows the operator to monitor the progress and decide whether any intervention is required.

BATCH INFORMATION		Date of Analysis: 11/01/18 09:56		Operator Name: Carl Zeiss	
Batch ID: 4		Batch Status: Auto-Analysis Completed		Batch Name: FH-20V-2084257	
Comments: Detecting and measuring all particles > 5µm					
SAMPLE INFORMATION		Sample Name: WFO	# Fields Analyzed: 815		
Sub Name: Fiber_2		Results: Feret Max Diameter (Microns)			
Size Class	0	1	2	3	4
Classification	0.0 < X < 10.0	10.0 < X < 20.0	20.0 < X < 50.0	50.0 < X < 100.0	100.0 < X < 500.0
Aligned Total	854	288	189	122	45
Al Alkyd	0	0	0	0	0
Al Alkyd	10	2	1	0	0
Cu Containing	141	42	50	28	10
Phthalate	29	16	9	3	1
MSW	1	1	0	0	0
Styren	0	0	0	0	0
ZSP	1	0	0	0	0
Unassigned	39	22	4	4	1
Cu Containing	121	35	36	20	7
MSW	248	118	71	38	13
Cu Containing	174	56	28	14	5
MSW	438	141	113	62	20
MSW	205	106	106	22	10
Unassigned	10	5	0	0	0
MSW	48	1	0	0	0
Unassigned	81	48	1	0	0
Total	8017	3133	2183	1068	693

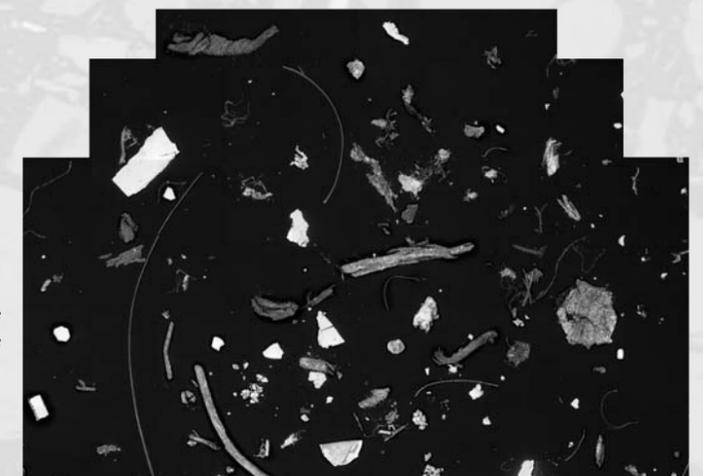
Example output report following ISO 16232 standard for manufacturing cleanliness.

SmartPI™ Reporter

A standalone application with a number of built-in tools allowing the operator to construct dedicated reports using drag-and-drop controls, modify one of the supplied report templates or select an ISO standard report. Once a report has been defined, it can be saved as a template for future use. SmartPI™ Reporter can be used either on-line for immediate report generation or off-line for subsequent results analysis.

SmartPI™ Explorer

This standalone application provides an intuitive user interface allowing the operator to browse or search the results for individual spectra, particle images, field images, border particles etc. In addition, SmartPI™ Explorer includes house keeping and archiving options and an image montage feature for creating a stitched image from the fields analysed. Explorer may also be used off-line, freeing machine time for analysis.



Example montage image created in the SmartPI™ Explorer module.

Review & Retrospective Analysis

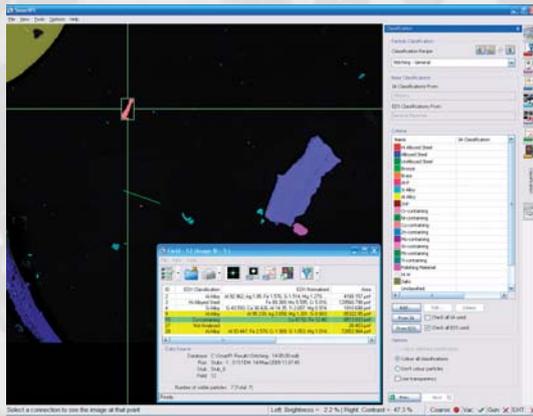
Review Output Mode allows a detailed examination of the results in order to refine and improve the classification recipes. This mode also allows the operator to re-examine any particle by returning the stage to the appropriate particle co-ordinates.

Retrospective Analysis allows the re-evaluation of existing results using new classification criteria without the need to re-analyse the sample. SmartPI™ offers results interpretation providing pass or fail recommendation for quality control and cleanliness applications thereby removing human subjectivity from all aspects of result generation.

More than 160 years of experience in optics has laid the foundation for pioneering light, electron and ion beam microscopes from Carl Zeiss. Superior integration of imaging and analytical capabilities provides information beyond resolution, unlocking the best kept secrets of your sample.

With a broad technology portfolio Carl Zeiss provides instruments both tailored to your requirements and adaptable to your evolving needs. With our highly versatile application solutions we endeavor to be your partner of choice.

Superbly equipped, regional demo centers provide you with access to our applications expertise developed in collaboration with world-class partners in industry and academia. Global customer support is provided by the Carl Zeiss Group together with an extensive network of authorized dealers.



Manual examination of target particle using Review Output Mode.

SmartPI™ is compatible with the following product groups:

SEM

Scanning Electron Microscopes

FE-SEM

Field Emission - Scanning Electron Microscopes

CrossBeam®

CrossBeam® Workstations (FIB-SEM)



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Carl Zeiss Microscopy GmbH
07745 Jena, Germany
microscopy@zeiss.com
www.zeiss.com/microscopy



We make it visible.