Turnkey Solution for Technical Cleanliness Inspection

For reliable and fast technical cleanliness inspection in all manufacturing industries

Simplify Your Technical Cleanliness

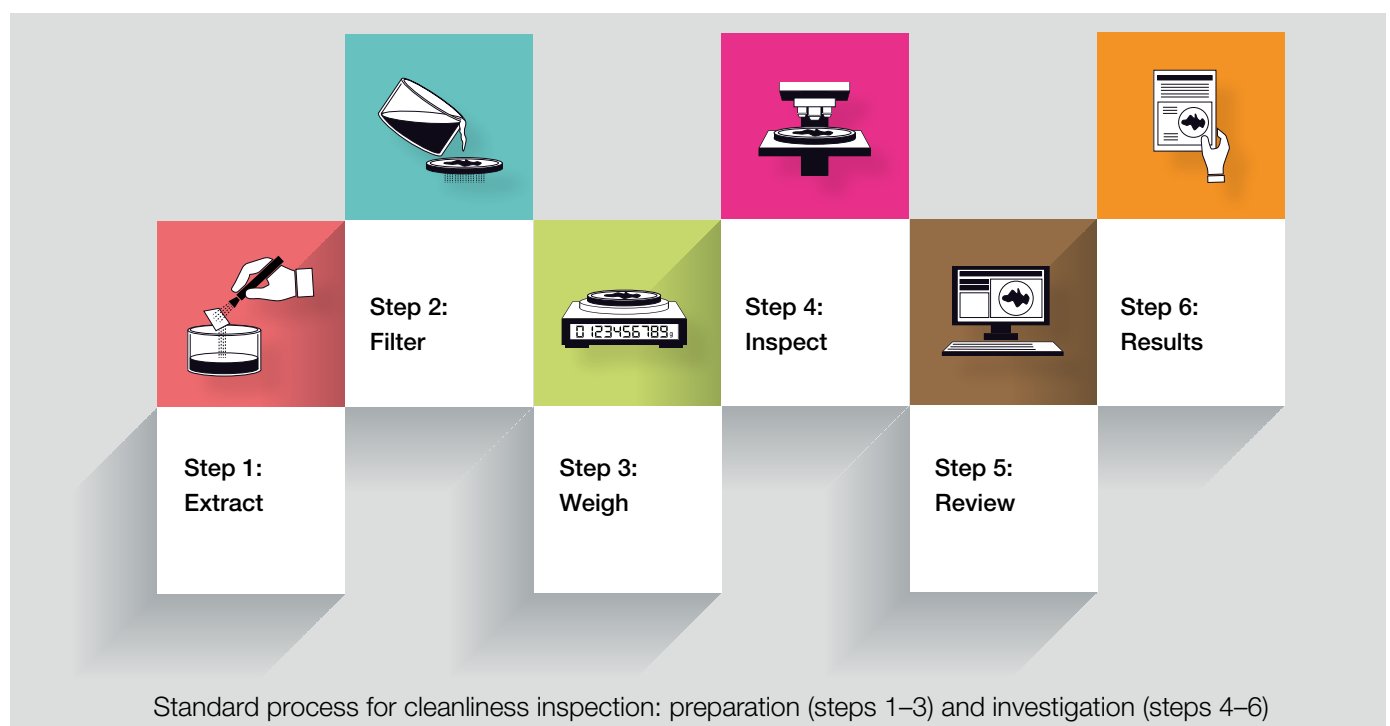## —— A Complete Solution for Cleanliness Process Control ——

Reliable

Seamlessly integrated hardware and software result in a durable, high-throughput system that delivers reliable and accurate data.

Intuitive

Dedicated, easy-to-use workflows minimize user action and provide reliable data — independent of the operator and experience level. User-friendly tools make it easy to revise inspection data.

The cleanliness of components, parts, and fluids is at the center of the manufacturing process. Meeting high standards for counting, analyzing, and classifying the often micron-sized contaminant and foreign particles is important for all processes: development, manufacturing, production, and quality control of the final product. International and national directives describe the methods and documentation requirements for determining particle contamination on essential machined parts since these particles directly impact the lifespan of parts and components. Previously, the mass of residue particles was used to characterize the residue. The standards in use today demand more detailed information about the nature of the contamination, such as the number of particles, particle size distribution, and particle characteristic.

The OLYMPUS CIX100 cleanliness inspection system is designed to meet the cleanliness requirements of modern industry and national and international directives.

| Step 1: Extract | Step 2: Filter | Step 3: Weigh | Step 4: Inspect | Step 5: Review | Step 6: Results |

Standard process for cleanliness inspection: preparation (steps 1–3) and investigation (steps 4–6)

Fast

The innovative all-in-one-scan solution enables scans with classification in reflective (metallic) and non-reflective particles to be completed twice as fast as other inspection systems. Immediate feedback of counted and sorted particles helps you make fast decisions.

Compliant

One-click reporting meets the requirements and methodologies set forth in international standards. Report customization (e.g., including particle morphology), makes it easy to meet company standards.

Reliable Turnkey System Solution: Automated and Accurate for High Reproducibility

The OLYMPUS CIX100 system is a turnkey solution designed to meet the needs of automated cleanliness inspection. Each component is optimized for accuracy, reproducibility, repeatability, and seamless integration for reliable data in a high-throughput system. The system provides excellent optical performance for fast inspections. Automation of critical tasks helps speed up inspections while minimizing human errors and the risk of contaminating the sample.

Excellent Optical Quality

Renowned Olympus UIS2 objectives and high-resolution camera provide exceptional image quality and accurate measurements.

Reproducibility and Repeatability

The OLYMPUS CIX100 system makes technical cleanliness inspections easy for inexperienced operators. A preconfigured and pre-calibrated system, user rights management, and regular system self-checks help ensure that the settings are correct for accurate and repeatable results. This means you can apply the same quality standards at different locations and get the same inspection results independent of the operator or system.
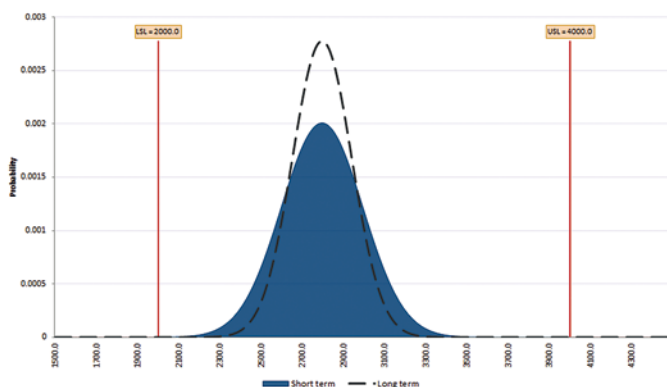
The diagram illustrates the OLYMPUS CIX100 precision by verifying the measurement stability and repeatability using the Process Performance Index (P_{Pk}). The same sample at 5x and 10x magnification was measured 10 times and the particle count from typical size classes was extracted. The diagram shows the evaluation of C_{Pk} and P_{Pk} on class E (50-100 µm).

Reproducible Measurement Conditions

The automatic focus drive helps ensure reproducible positioning for straightforward reinvestigation of detected contaminants. The stage insert maintains a secured membrane position and features an additional insert for the integrated calibration tool or a second sample.
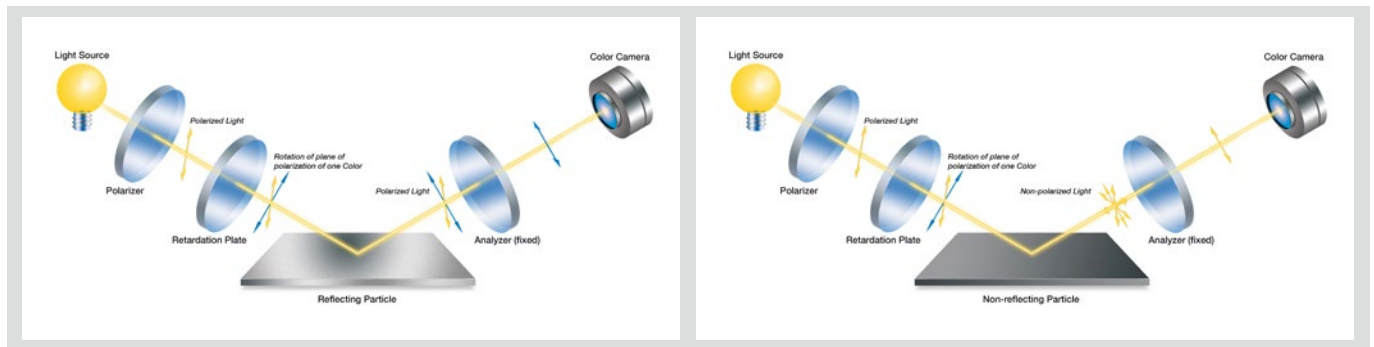
Excellent Optical Quality

Olympus UIS2 objectives provide high optical performance for excellent measurement and analysis accuracy. A dedicated light source maintains a consistent color temperature optimized for cleanliness inspection.

Innovative Polarization Method

Detects both reflective (metallic) and non-reflective particles in a single scan.

Easy to Use

Easy-to-use software guides users through the entire inspection process, helping to boost productivity and minimize errors. The interface has large buttons that are easy to click with a mouse or the touch screen monitor.

High Performance

While scanning the sample, the system gives direct visual feedback of classified and counted contaminants with color changes. Optionally, the system can emit an acoustic warning signal when limits are exceeded.

Optimized Reproducibility

The preconfigured and pre-calibrated system has reminders for automatic system self-checks with the integrated calibration slide that helps maintain regular system verification.

Stable Measurement System

The optical path alignment, motorized nosepiece, and the camera are protected by a cover to prevent accidental modifications. For greater stability, all moving parts have been eliminated from the optical light path.

Intuitive Guidance for Maximum Productivity

The OLYMPUS CIX100 system delivers enhanced performance and productivity through the entire inspection process and makes technical cleanliness inspections easy for operators of every experience level. The software provides step-by step guidance for the entire cleanliness inspection. Intuitive workflows and user rights management improve productivity and confidence in results while reducing cycle time, cost-per-test, and user errors. The result is a system optimized for high quality standards.

Use the Entire Screen

The full-screen application enables the operator to view the sample using maximum screen space without disturbing the computer's task bar.
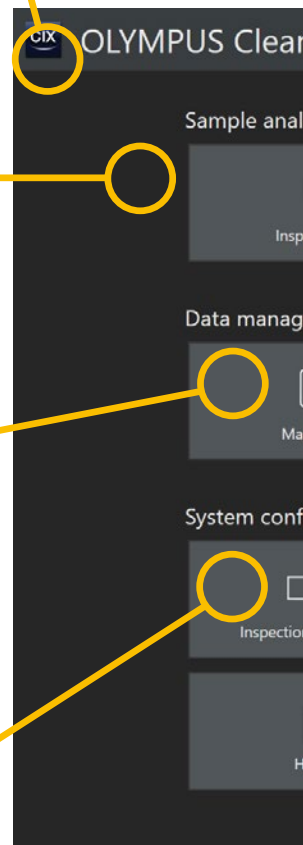
Reliable Data

The system regularly reminds to perform automatic system checks for precise results.

Storage and Sharing

All data are saved automatically. Users can quickly access all the archived samples, as well as their associated data and reports for revision or distribution.

Easy for Every Experience Level

A preconfigured, pre-calibrated system combined with an intuitive user interface helps make cleanliness inspection easy for operators of every experience level.

User Rights Management Tools

Administrators can control which users have access to different parts of the system. This helps inexperienced users stay on task. Importantly, they also cannot influence critical parameters like calibration and data selected for the automatically generated report.
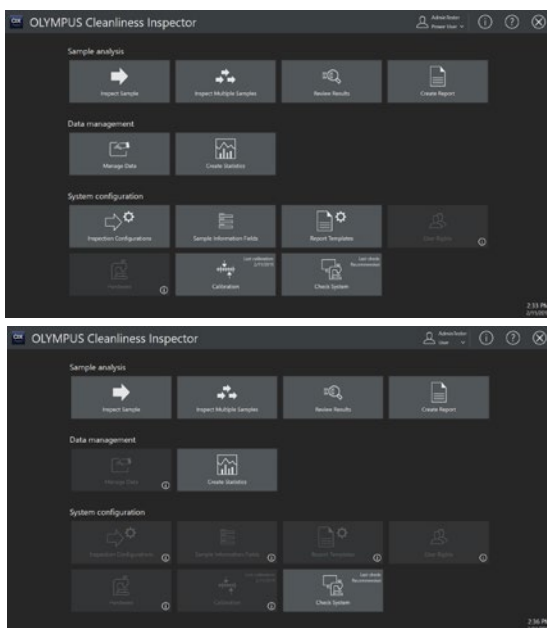
Administrators can access the complete system setup (top), while inexperienced users can be limited to basic workflows (bottom).

Inspect a Sample

Step by step, the intuitive interface guides operators through the complete inspection process. The result is a fast, productive workflow.
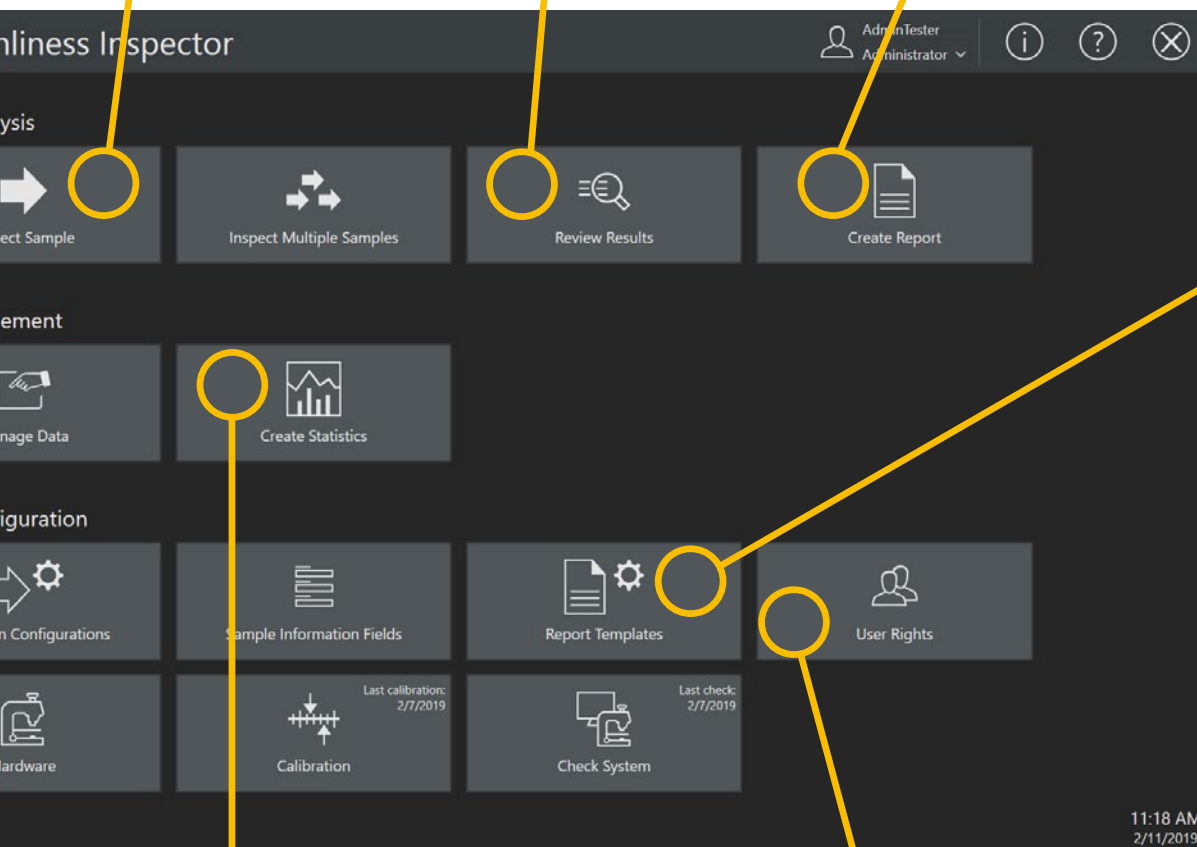
Straight to Inspection

Start scanning the membrane using the selected inspection configuration.

Straight to Revision

Review scanned or stored results, including validation.

Straight to Report

Create or print reports that comply with industry standards based on the inspection results.

Cleanliness Inspector

AdminTester
Administrator

Analysis

Inspect Sample

Inspect Multiple Samples

Review Results

Create Report

Management

Manage Data

Create Statistics

Configuration

Inspection Configurations

Sample Information Fields

Report Templates

User Rights

Last calibration: 2/7/2019

Hardware

Calibration

Last check: 2/7/2019

Check System

11:18 AM
2/11/2019

Report Customization

Customize report templates for industry standards and user-specific requirements.

Trend Analysis

Trend analysis helps to identify potential measurement deviation over time by plotting quality control charts.

Administrative Support

The administrator can control the operating rights of individual users.

Touch Screen Support

The interface has large buttons that are easy to click with a mouse or the touch screen monitor.

Inspection Configurations

Inspection configurations are used to specify the parameters for sample inspection, including rules for particle characterization and defining particle families and types.

Access to the inspection configurations

Specification of settings for the standard

Specification of settings for the particle family

Specification of settings for the particle types

ISO 11218:1993
ISO 12345: 2013
ISO 14952: 2003
ISO 16232-10 2007 (A)
ISO 16232-10 2007 (N)
ISO 16232-10 2007 (V)
ISO 4406:1999
ISO 4407:1991
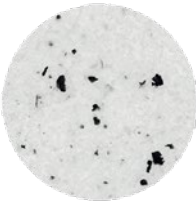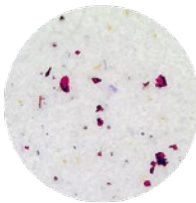NAS 1638 - 1964
NF E 48-651:1986

Fast Live Analytics and Review Full Confidence in Results

All Relevant Data Displayed in One Place

The OLYMPUS CIX100 system offers high-performance image acquisition and precise live analytics of both reflective and non-reflective particles ranging from 2.5 µm up to 42 mm in a single scan thanks to a patented* polarization method. This all-in-one-scan solution enables scans to be completed twice as fast as the classical method (Inspector series). Counted and sorted particles are displayed live and sorted into size classes while the scan is acquired, supporting direct decision making and helping ensure a fast reaction time in case of a failed test.

Fast: Capture Data in a Single Scan

An innovative polarization method based on wavelength separation and color detects both reflective (metallic) and non-reflective particles in a single scan. Integrated into the microscope frame, this high-throughput design enables scans to be completed twice as fast as the classical method (Inspector series) and eliminates moving components from the optical light path, such as the polarizer, which could negatively impact the system stability, leading to potentially incorrect results. This all-in-one-scan technique increases the number of inspected particles, reducing the cost per test and shortening the reaction time in case of a failed test.

Short Reaction Time

All relevant data are displayed live on a single screen during the inspection, enabling the operator to stop or interrupt the inspection if a test fails.

High Throughput

The innovative all-in-one-scan technology detects both reflective and non-reflective objects in one scan.
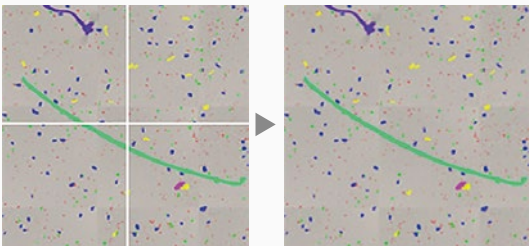
Detect Dark or Bright Particles

Scan dark particles on a bright background or vice versa.

Detect Small and Large Particles

Live processing and classification of both small and large particles according to international standards (2.5 µm up to 42 mm).

'Classical' method		Single-scan solution: Combined
First recording: Non-reflecting	Second recording: Reflecting	

Intelligent Handling of Large Particles

The OLYMPUS CIX100 system offers live processing of contaminants ranging from 2.5 µm up to 42 mm and automatically reconstructs images of large particles.
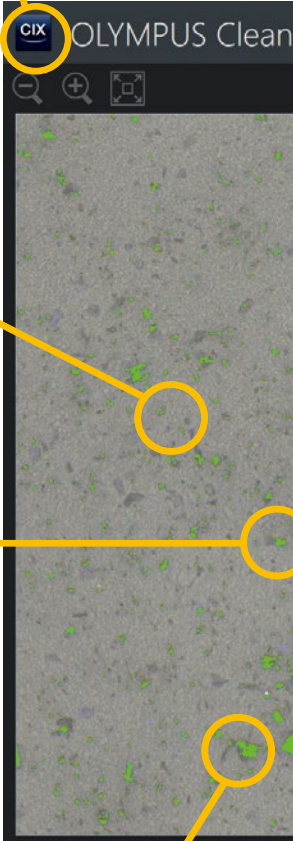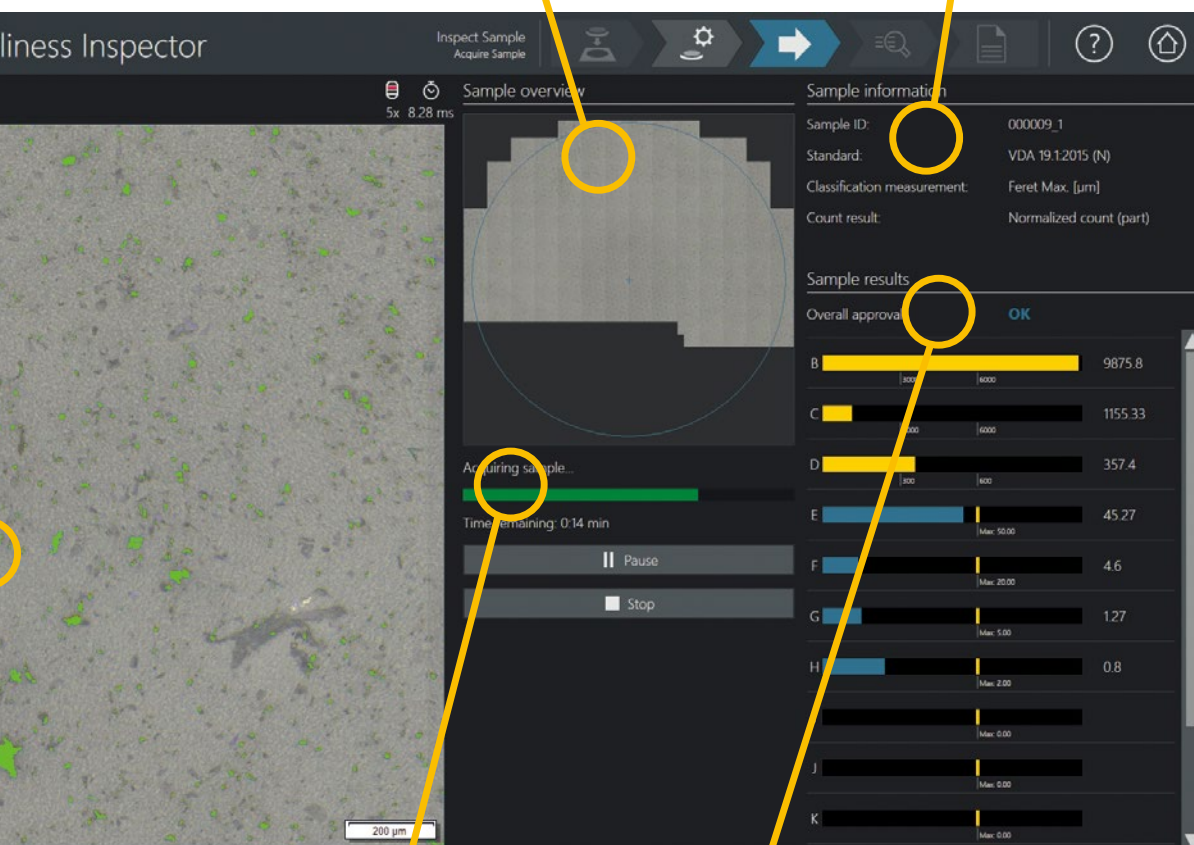
*DE102013219181B4

Direct Identification

Each tile of the analysis is directly stitched during the scan with markers on identified particles.

Sample Information Overview

Inspection configurations are used to specify all parameters for sample inspection.


Time Information

Clearly view the time remaining for sample acquisition.

Live Analytics

Contaminants are automatically analyzed and sorted into size class bins defined by the selected standard and are color coded to clearly indicate which size class exceeds a predefined limit.

Overview Image

The sample overview image is created at the beginning of the sample inspection and displays the entire filter at low magnification. The overview image helps to identify filter coverage and particle clusters before the sample inspection starts.
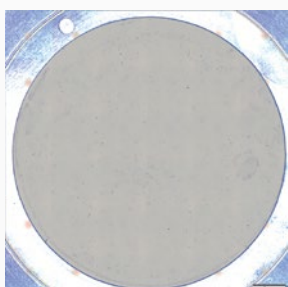
Direct Result Feedback

Predefined acceptable particle counts per size classes are displayed, and the sample can be validated (OK) or rejected (NOK) even before the complete membrane is acquired. An acoustic signal can be switched on when the approval reads NOK or the inspection is finished.

Flexible for Evaluation and Revision

The OLYMPUS CIX100 system combines powerful, easy-to-use tools to revise inspection data with a fast, guided particle review. The one-click reclassification function provides flexibility and supports international standards. Thumbnail images of every contaminant detected by the system are linked with dimensional measurements, making it easy to review the data. Retrieving a contaminant's information is simple. During the review process, the results are updated and displayed automatically in all views and size classification bins. This saves you time with clear representations of all relevant inspection results.

Complete Dataset

All particles, classification tables, overall cleanliness code, particle location, and the standard used appear in one view.

Deep Data Insights

At-a-glance display of complete inspection data in various selectable views.

Direct Identification

View images of particles organized from largest to smallest for all kinds of particles (reflective or non-reflective).

Quick and Easy: Review, Revise, and Recalculate

Operators can easily revise their inspection data. Powerful software tools including delete, split, and merge make revising the data simple.

	Before	After
Delete Particles		
Split Particles		
Merge Particles		
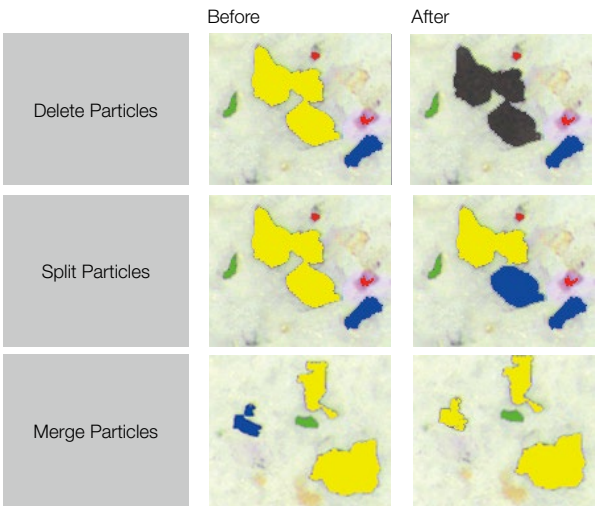
The OLYMPUS CIX100 system has tools that make it easy to revise inspection data during the review step.
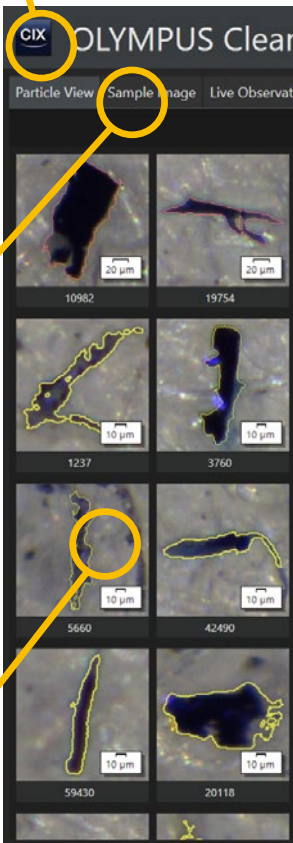
Trend Analysis
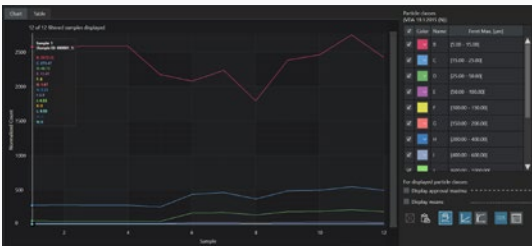
Data statistical analysis can be performed over time and graphically displayed.

Revise Inspection Data

Based on the stored particle position information, the stage directly repositions at a selected particle position for further investigation and revision, such as with an Extended Focus Image (all-in-focus image, EFI) or a tailored solution for a height measurement of the contaminant.

Easy Data Review

Thumbnail images of contaminants are conveniently linked with their locations and dimensions. Selecting a thumbnail automatically drives the system to this contaminant.

Precisely Compliant

Results can be recalculated to all standards with one click.

Direct Feedback

Calculate and display the overall contamination class code (CCC) according to the selected standard.
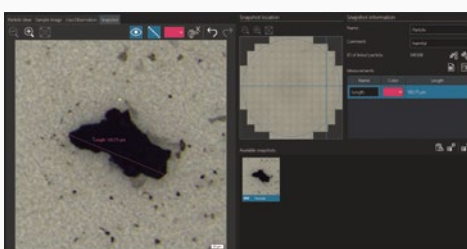

Trusted Results

Classification and particle tables show the results according to the selected standard and particle data, respectively.

Advanced Particle Information

As an optional feature, height measurement results for selected particles are automatically added to the result sheet for further investigation.

Particle Snapshots Documentation

Individual images of contaminants can be taken and processed for manual measurement confirmation and improved documentation.

Apply Company Standards

Evaluation is performed according to all major international standards used in the automotive and aerospace industries. Companies also have the flexibility to set up their own evaluation standards. Reports can be easily modified to meet the needs of your company.
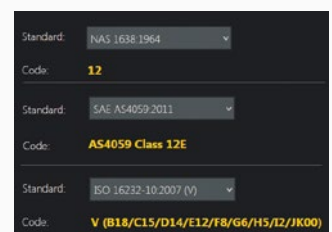
Efficient Report Creation

Smart, sophisticated reporting tools enable easy one-click digital documentation of inspection results. Reports are based on predefined templates that comply with industry standards and can be easily modified to meet the needs of your company. Export the results to Microsoft Word or directly export as a PDF for easy data sharing over email. Report templates and data sharing tools help inexperienced operators quickly create and distribute accurate, professional documentation. The OLYMPUS CIX100 system can also archive reports and data for record keeping and trend analysis.

Professional

Generate high-quality, professional reports with predefined templates.

Intuitive

Easily create analytical reports that comply with the standard used during analysis. Customize the templates with one click.

Flexible

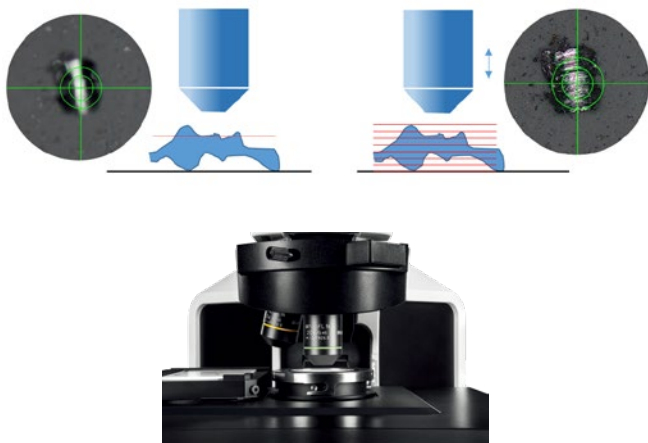Support of different output formats including MS Word and PDF.

Adaptable

Easily adapt templates and reports to meet company regulations.

Height Measurement Solution

The OLYMPUS CIX100 system's extended focus imaging (EFI) function captures images of samples whose height extends beyond the objective's depth of focus and stacks them together to create an all-in-focus image. In addition, the CIX100 system can be further enhanced with a height measurement solution consisting of a 20X objective and special software to fulfill the VDA 19 requirements for height measurements. For selected particles, the height measurement is performed either automatically or manually. The calculated height value is listed as an additional data field in the results sheet.
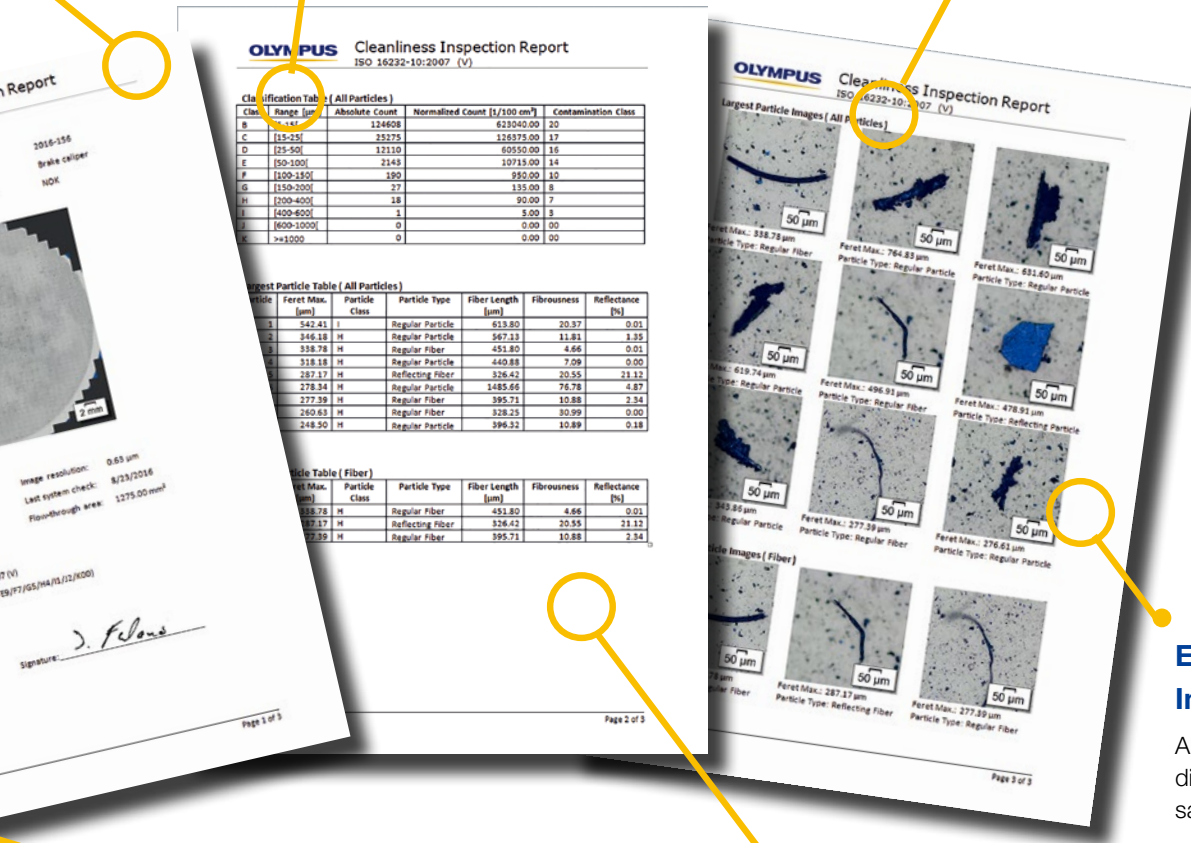
Predefined Templates

Reports are based on predefined templates that comply with industry standards and can be easily modified to meet the needs of your company.

Smart Variability

Reports are performed according to the methodologies set forth in international standards.

Straight to Report

Create or print compliant reports based on further inspections.

Extended Focus Images (EFI)

All-in-focus images can be directly included in the sample report.

Easy Result Sharing

Report file sizes are optimized for efficient exchange

Long-Term Data Storage

Keep records to justify a decision years later.

Easy Data Export

Exporting a report is as easy as clicking your mouse. Export the reports into Microsoft Word or PDF, depending on your requirements. Statistics, like trend analyses, can be exported to Microsoft Excel just as easily.

Word

PDF

Excel

Long-Term Data Safety

Inspection data and reports need to be archived for a certain period of time.

Hardware

Microscope	OLYMPUS CIX100	Motorized focus	• Coaxial motorized fine focus with 3-axis joystick • Focus stroke 25 mm • Fine stroke 100 µm / rotation • Maximum height of stage holder mounting: 40 mm • Focus speed 200 µm/sec • Software autofocus enabled • Customizable multi-point focus map
		Illumination	• Built-in LED illumination • Innovative illumination mechanism with simultaneous detection of reflecting and non-reflecting particles • Light intensity controllable by software
		Imaging device	• Color CMOS USB 3.0 camera • On chip pixel size 2.2 µm x 2.2 µm
		Sample size	• The standard sample is a filter membrane of diameter 47 mm. Filter holders with 55 mm membrane diameter or customized sample holders can be provided.
Nose piece	Motorized type	Motorized nosepiece	• 6-position motorized nosepiece with 3 UIS2 objectives already installed • PLAPON 1.25X used for preview • MPLFLN 5X used for detecting particles bigger than 10 µm • MPLFLN 10X used for detecting particles bigger than 2.5 µm
		Software controlled	• The image magnification and relation between pixel and size is known at every moment. • Selected objectives are used at selected steps in the measurement process, objectives are automatically positioned.
Stage	Motorized stage X,Y	Motorized stage X,Y	• Stepper motors controlled movement • Maximum range: 130 mm x 79 mm • Maximum speed: 240 mm/s (4 mm ball screw pitch) • Repeatability: < 1µm • Resolution: 0.01 µm • Controllable with 3 axis joystick
		Software controlled	• Scanning speed depends on the used magnification, at 10x the scanning time is typically less than 10 minutes. • Stage alignment is performed at factory assembly.
	Specimen holder	Sample holder	• Membrane holder is specially designed to avoid an unwanted rotation of the membrane during mounting. • The membrane is mechanically flattened by the membrane holder. • No tool is needed to fix the cover.
		Particle Standard Device (PSD)	• Reference sample used to validate the system measurement. • Sample used in the check system's built-in function for controlling the proper function of the CIX. • The PSD is always assigned slot 2 on the stage.
	Stage insert	2-Position stage insert	• Stage insert dedicated to the right positioning of the sample holder and the PSD
Controller	Workstation	High-performance pre-installed workstation	• HP Z4G4, Windows 10-64 bit Professional (English) • 16 GB RAM, 256 GB SSD and 4 TB data storage • 2 GB video adaptor • Microsoft Office 2019 (English) installed • Networking capabilities, English qwerty keyboard, optical mouse 1000 dpi
		Add-in boards	• Motorized controller, RS232 serial and USB 3.0
		Language selection	• Operating system and Microsoft Office default language can be changed by the user
	Touch panel display	23-inch slim screen	• Resolution: 1920 × 1080, optimized for use with the CIX software
Power		Rating	• AC adaptor (2), controller and microscope frame (4 plugs necessary) • Input: 100-240V AC 50/60Hz, 10 A
		Power consumption	• Controller: 700 W; Monitor: 56 W; Microscope: 5.8 W; Control Box 7.4 W • Total: 769.2 W
Drawing		Dimensions (W × D × H)	Approx. 1300 mm × 800 mm × 510 mm (51.2 in. × 31.5 in. × 20 in.)
		Weight	44 kg (97 lb)

System Environment Limitations

Normal use	Temperature	10 °C to 35 °C (50 °F to 95 °F)
	Humidity	30 to 80%
For safety regulations	Environment	Indoor use
	Temperature	5 °C to 40 °C (41 °F to 104 °F)
	Humidity	• Maximum 80% (up to 31 °C [88 °F]) (no condensation) • Usable humidity declines linearly as temperature rises above 31 °C (88 °F) • 70% (34 °C [93 °F]) to 60% (37 °C [98 °F]) to 50% (40 °C [104 °F])
	Altitude	Up to 2,000 m (6,562 ft)
	Level of horizon	Up to ± 2°
	Power supply and voltage stability	±10%
	Pollution level (IEC60664)	2
	Overall voltage category (IEC60664)	II

Software

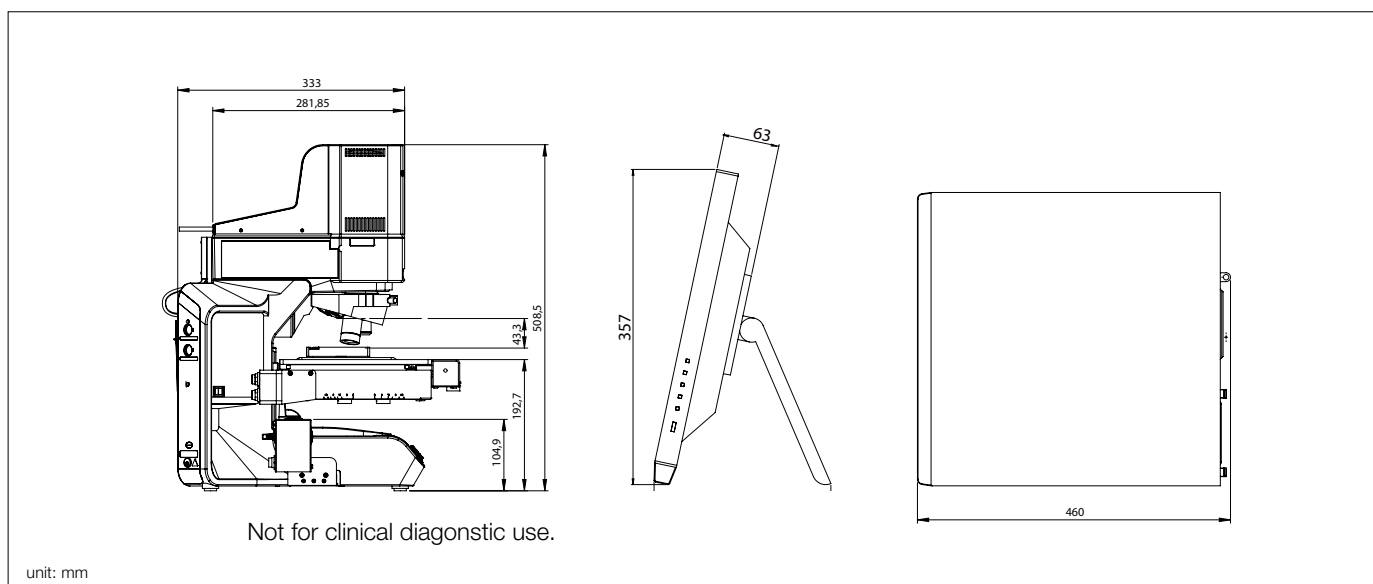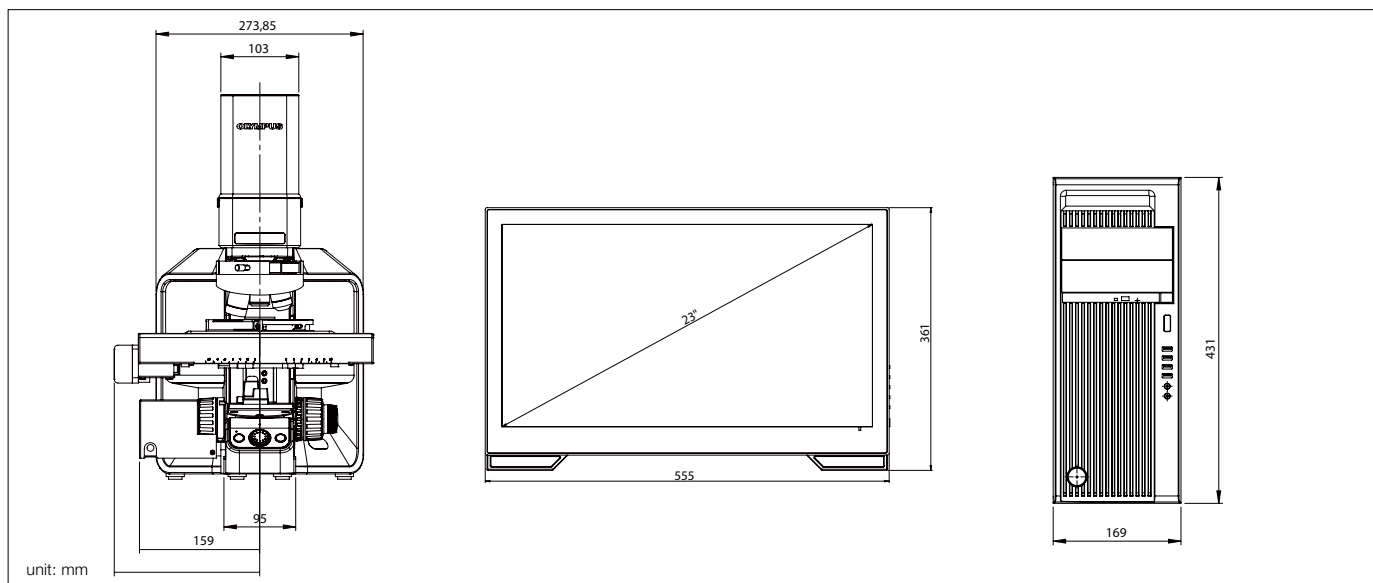| Software	CIX-ASW-V1.4.2	• Dedicated workflow software for technical cleanliness inspection
Languages	GUI	• GUI: English, French, German, Spanish, Japanese, Simplified Chinese and Korean
	Online help	• Online help: English, French, German, Spanish, Japanese, Simplified Chinese and Korean
License management		• Software license activated by license card (already activated at installation)
User management		• System can be connected to a network for domain administration. • The range of functions can be selected depending on the authenticated user.
Live image	Display in color mode	• Particles are analyzed with blue color for metallic ones and original color for non-metallic ones.
	Window fit method	• The image is always displayed in a full view.
	Live detection	• Particles are analyzed as soon as they are captured for improved speed. • User can stop the process if the measurement result is not good.
Image capture and manual measurements	Collecting user snapshots	• In the review mode, it is possible to acquire single images from any position on the sample, as well as acquire images in the live observation mode (from the direct image) or the sample view mode (from recorded data). • Images can be stored in .tif, .jpg or .png files with a standard resolution of 1000 × 1000 pixels. • Snapshots can be linked to a detected particle and later used in the analytical report. • Particle snapshots can be automatically acquired in EFI (Extended Focus Imaging) mode. • Recordings taken in EFI mode can be used in the analytical report.
	Manual measurements	• It is possible to perform arbitrary distance measurements on an acquired snapshot. • Arbitrary measurements can be renamed and the annotation can be colored. • Arbitrary measurements and scale bar are burned in the image when stored.
Hardware control	XYZ motorized stage	• Joystick operation and control by software • Automatic or manual repositioning on selected particles
	Motorized nosepiece	• Selection by software only
	Motorized focusing	• Control by joystick • Software autofocus available • Predictive autofocus using multipoint focus map
Check system	System verification	• System is verified by measuring the Particle Standard Device parameters. • OK or NOK quality value is produced.
	Selectable objective	• Check system can be performed only with the working objective (one objective should be selected at least). • Check system is performed with either 5X or 10X objectives, or both.
Technical cleanliness standards	Supported standards:	• ISO 4406:2017; ISO 4407:1999; ISO 4407:2002 [Cumulative and Differential]; ISO 11218:1993; ISO 12345:2013; ISO 14952:2003; ISO 16232-10:2007 (A, N, and V); ISO 16232:2018 (A, N, and V); ISO 21018:2008; DIN 51455:2015 [70% and 85%]; NAS 1638:1964; NF E 48-651:1986; NF E 48-655:1989; SAE AS4059:2011; VDA 19.1:2015 (A, N, and V); VDA 19.2:2015
	Fully compliant to VDA 19.1 and VDA 19.2 recommendations	• Thresholds are automatically set at the VDA recommend values.
	Identification of particle types	• Particles can be classified by particle types (non-reflecting, reflecting, fibers, or others).
	Customized standards	• User defined standards can be defined easily. • Particle measurement parameters include filiform particle size and compact particle size according to DT 55-83.
	Inspection configuration	• The system enables users to load, define, copy, rename, delete, and save an inspection configuration. • Standards and report templates can also be stored and recalled. • It is possible to invert the detection threshold to detect bright particles on a dark background. • It is possible to acquire several samples in a sequence. • Each sample can be inspected with a particluar configuration.
Particle tile view	Displays the detected particles in tile for improved navigation	• Every particle position can be retrieved by double click on the tile. • Every tile is adapted to the actual particle size.
Store the full membrane	The complete filter is stored	• Offline analysis enables users to select a different standard for the results display.
Data export	Save data	• Inspection data can be exported to an Excel (.xlsx) table. • All tables available in the software can also be exported into Excel.
Trend analysis	Trend analysis over several samples (Built-in SQC tool)	• Data per size classes can be displayed. • Data can be plotted over time, sample, measurement ID. • Scale can be selected (log-normal, log-log). • Data points can be extracted and exported to spreadsheet. • Table can be exported in Q-DAS (.dfq) format. All tables available in the software can also be exported into Excel.
Particle Edition	Particles can be edited during the revision process.	It is possible to: • Add, delete, merge, or split particles with lines or polyline. • Change the particle type.
Dynamic reports	Professional analytical reports can be produced by using Microsoft Word 2019	• Templates are precisely customizable • Users can choose to put the pictures after the table or keep all pictures grouped together when selecting different particle families.

Optional Solution CIX-S-HM

Height Measurements	Automatic or Manual height measurement of selected particles	• Optional software solution that drives the motorized focus drive from top to bottom of selected particles. The particle height is then processed from the difference between the top and the bottom Z coordinate. • Includes an additional objective lens (20X MPLFLN) and a license card that needs to be activated at installation. • It is possible to select multiple particles for automatic height measurement at several positions.

Environmental Law and Regulations

Europe	Low Voltage Directive 2014/35/EU
	EMC Directive 2014/30/EU
	RoHS Directive 2011/65/EU
	REACH Regulation No. 1907/2006
	Packaging and Packaging Waste Directive 94/62/EC
	WEEE Directive 2012/19/EU
	Machinery Directive 2006/42/EC
USA	UL 61010-1:2010 Edition 3
	FCC 47 CFR Part15 SubPartB
Canada	CAN/CSA-C22.2 (No. 61010-1-12)

Australia	Radio communications Act 1992, Telecommunications Act 1997
	Regulation on Energy conservation AS/NZS 4665-2005
Japan	Electrical Appliances and Material Safety Act (PSE)
Korea	Electrical Appliances Safety Control Act
	Regulation on Energy Efficiency Labeling and Standards
	Regulations for EMC and Wireless Telecommunication (Notice 2913-5)
China	China RoHS
	China PL Law
	Regulation for Manuals

Dimensions

CIX100

273,85
103
23"
361
555
431
169
95
159
unit: mm

333
281,85
63
508,5
43,3
357
192,7
104,9
460

Not for clinical diagonstic use.

unit: mm

www.olympus-ims.com

OLYMPUS CORPORATION
Shinjuku Monolith, 2-3-1 Nishi-Shinjuku, Shinjuku-ku, Tokyo 163-0914, Japan