

Led by experience. Driven by curiosity.

FF35 CT

The high-resolution, multi-application
CT system for science & research.



comet
yxlon



Comet Yxlon – this is who we are.

Comet Yxlon designs and manufactures high-end X-ray and CT system solutions for industrial environments – based on customer-centric product development. We're proud to be part of Comet, the globally leading Swiss technology company with a focus on plasma control and X-ray technology.

**Led by experience.
Driven by curiosity.**

Deeper insights.

Looking beyond the surface is our core competency at Comet Yxlon – but not only in a technical way.

Zooming in on your industry, applications and business challenges allows us to develop innovative and relevant solutions that help you shape future markets. Faster time to market? Avoiding production downtimes? The perfect image with the highest resolution, as fast and easy as possible? Whatever your goal – let's talk about it!



The flexible system with dual-tube set-up covers a wide range of applications.

Your benefits with the FF35 CT:

- Single or dual tube configuration for highest versatility in laboratory micro-CT applications
- Vista software packages for best-in-class image quality and speed
- Precise manipulation and temperature stability
- Various CT trajectories and FOV extensions
- Metrology version available
- Special version for semiconductor lab applications related to wafer processing and Advanced Packaging.

Three tubes, one goal: maximum versatility.

With its optional dual-tube set-up the FF35 CT combines unprecedented CT data quality with highest versatility when inspecting finest and medium-sized parts.



High-power 225 kV microfocus tube and 190 kV nanofocus transmission tube – the perfect combination.

Single or dual-tube set-up

To match your inspection needs, we offer a single-tube set-up with a microfocus tube or one of our two nanofocus tubes. You can also choose a dual-tube configuration – combining the microfocus tube with one of the nanofocus options. Since all tubes have their own generator and HV cable, they can be switched without the need of reconfigurations.

Microfocus directional beam tube

With its high power of 320 W and the water-cooled target, the 225 kV Comet Yxlon directional beam tube allows quick CT scans in less than a minute. In 2D operation, the tube reaches a spatial resolution of 4 µm.

Nanofocus transmission tubes

For submicron resolution, the Comet Yxlon nanofocus tubes are the right choice. Their water-cooled heads allow for quick temperature balance and highest focal spot stability.

While the 190 kV tube enables with four modes the optimal adjustment of focal spot size in relation to power, the 160 kV tube is the perfect solution for high resolution applications at 600 nm resolution and continuous operation. It combines the classic advantages of open and closed tubes with outstanding long-term stability and a low-maintenance.

That's versatility: Choice of two detectors to match your needs

The 4343 CT delivers top performance for small to large parts with a pixel size of 150 µm and an active area of 432 x 432 mm. For even smaller details, our 3131N with a pixel size of 100 µm may be the perfect choice.

Which items can the FF35 CT inspect?

Electronic components incl. SMD and semiconductor packages
Wafer coupons and dies
Microsystems (MEMS, MOEMS)
Products involving new materials or manufacturing methods, e.g. AM components, fiber-reinforced plastics
Battery cells and modules
Injection molded plastics
Medical objects, e.g. cannulas
Light-alloy castings
Geological, paleontological and biological samples

Which applications is it designed for?

Quality assurance, material analysis, material research
Failure and structure analysis
Assembly checking
Inspection of small serial productions
Process control
Digitization
Segmentation

The FF35 CT Metrology: measuring finest inner structures.

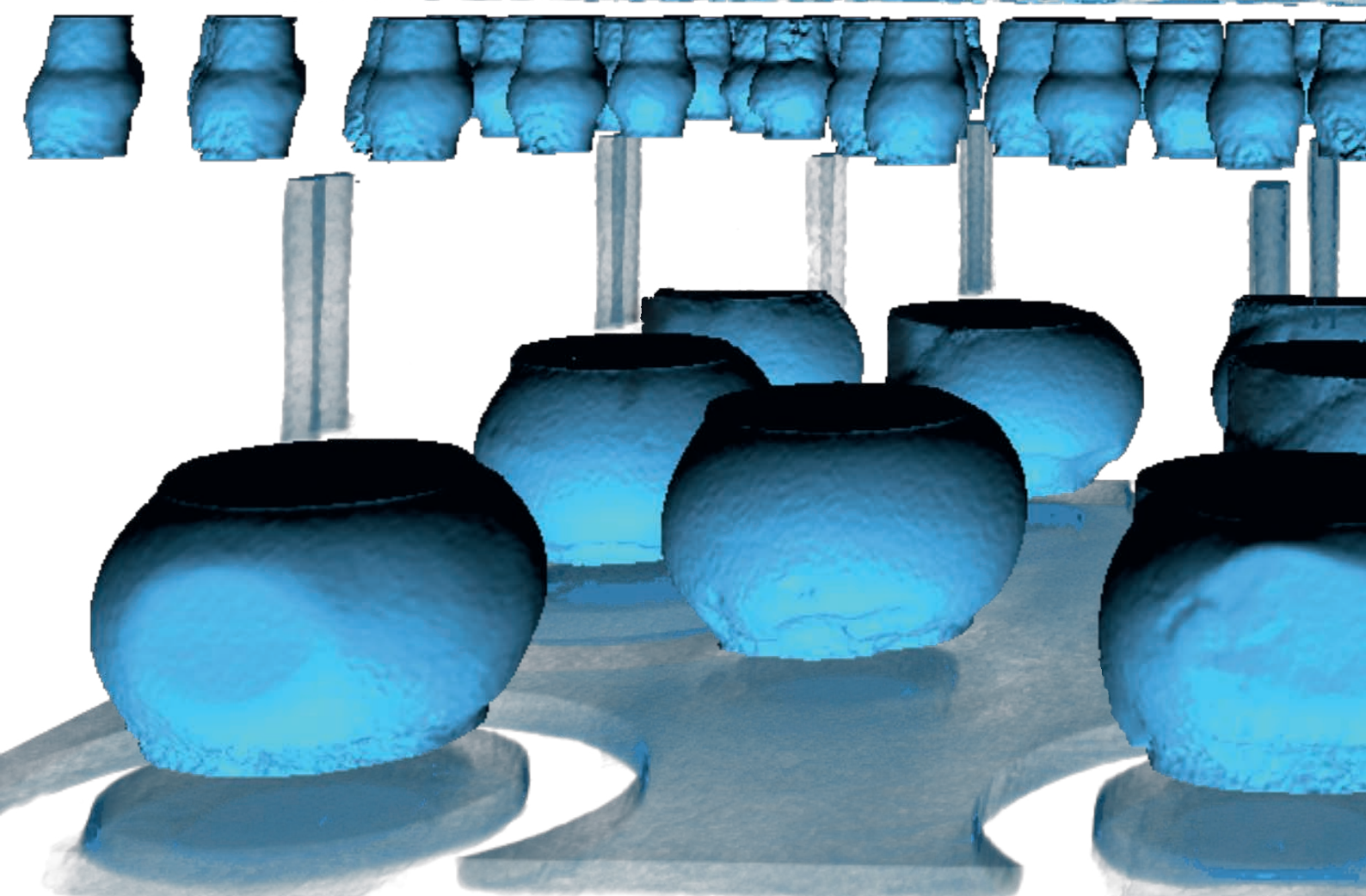
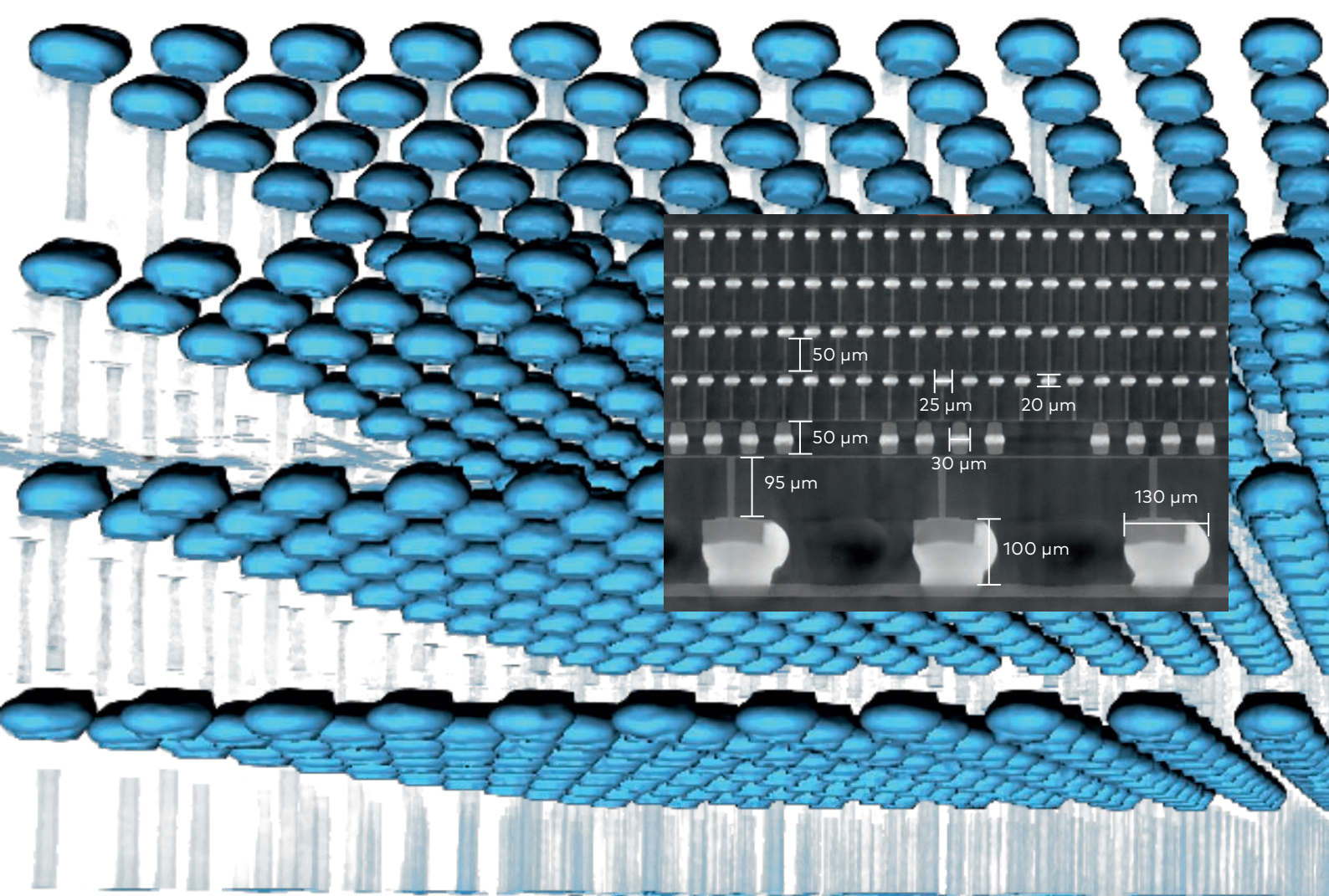
With its ability to capture nearly unlimited measuring points in one CT scan decoupled from the measurement evaluation, the metrology version of the Comet Yxlon FF35 CT takes accuracy to the next level. Seamless defect analysis and nominal-actual comparison save time and reduce correction loops. Smart fan control enables the stabilization of the interior temperature, making the FF35 CT Metrology compliant with temperature range regulations defined by VDI 2627.

FF35 CT Semi: for applications in the semiconductor field.

The Comet Yxlon FF35 CT Semi is an innovative, versatile high-resolution CT system for use in R&D and quality assurance. It was developed specifically for inspections in semiconductor-related industries. The FF35 CT Semi meets the high SEMI® standards, including the hazard and safety standards SEMI® S2-0818 & SEMI® S8-0218, and is certified accordingly.



Opposite: CT scan of a GPU: 1.4 mm x 1.4 mm field of view, 213 times magnification, showing HBM bumps, TSVs, μ bumps and C4 bumps.



Software solutions for accurate, repeatable, fast results.

See better, faster, more: Our wide range of integrated and optional software features for the FF35 CT facilitate inspection workflows with exceptional results in clarity, efficiency and insights.



More clarity, efficiency and insights

Comet Yxlon image software solutions are as diverse as your applications. In order to supply you the best inspection results, we have structured our Software Suite into three interconnected pillars, serving three specific areas of interest.

"Clarity" focuses on detail-rich image acquisition, by offering a wide range of easily adjustable scan trajectories and image optimization tools, which allow you to see more details in your inspection part while saving time.

"Efficiency" helps you streamline workflows through seamless connectivity and automation.

Last but not least, "Insights" features powerful solutions for image analysis and process control. It enables you to improve product and process quality by extracting critical information from image data – and to stay ahead of your market.

Image quality optimizations.

ScatterFix 2.0

The innovative ScatterFix 2.0 functionality developed by Comet Yxlon reduces scatter radiation to improve the quality of the CT data, e.g. for optimized surface determination.



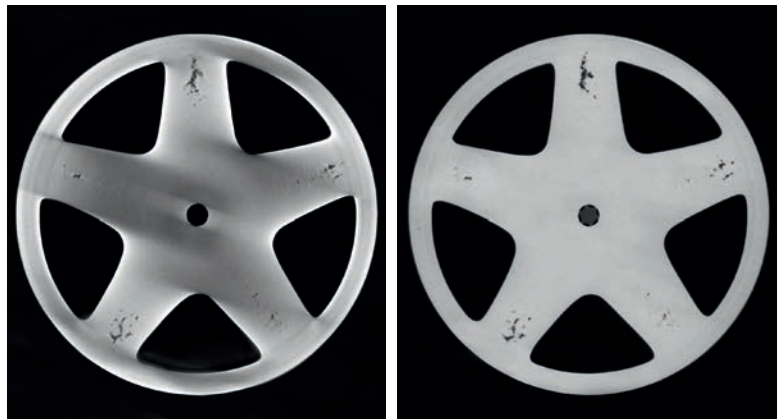
Improving image quality: Cone-beam CT without (left) and with ScatterFix 2.0 (right).

Beam hardening correction (BHC)

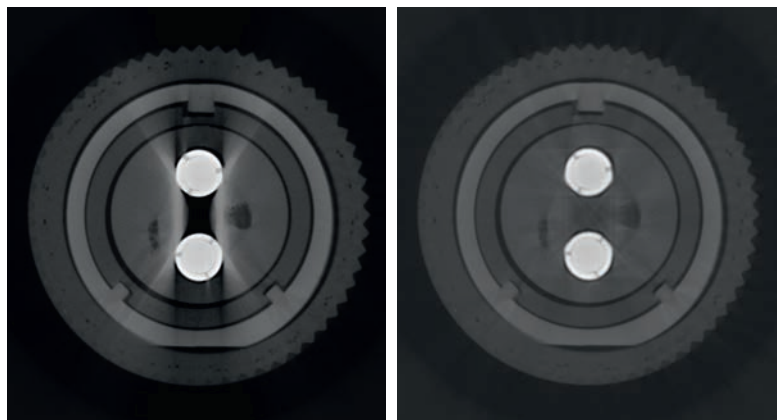
It allows the correction of unwanted gray-value gradients in otherwise homogeneous materials, e.g. in order to reliably carry out a pore analysis.

Metal artifact reduction (MAR)

With complex components consisting of plastics and metals, MAR significantly reduces the interfering effects causing the less dense material to 'disappear'.

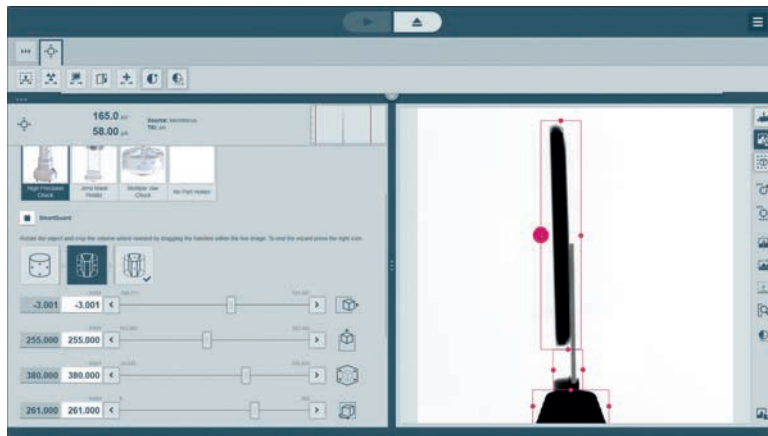


Eliminating unwanted gray-value gradients: Cone-beam CT without (left) and with Beam Hardening Correction (right).

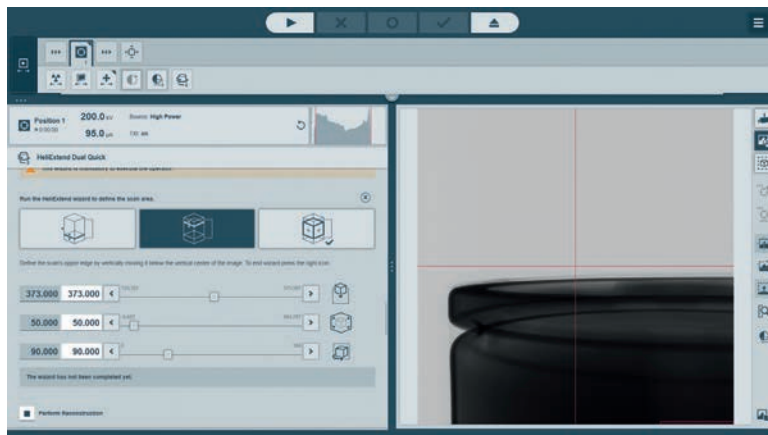


Reducing interferences: Cone-beam CT without (left) and with Metal Artifact Reduction (right).

Intelligent CT trajectories.



Highly precise manipulation: The SmartGuard wizard allows to define the exact contours of (asymmetrical) test parts.



The scan set-up of a dual helical scan is fast and intuitive thanks to our wizards which calculate the geometric offset automatically based on the magnification.

Collision protection

The intuitive SmartGuard takes collision protection to the next level. Benefit from highest magnifications without risking damage to part or system by following the exact outline of your part.

Helical scan trajectories

Helical scan trajectories avoid cone beam artefacts when scanning high parts. We offer two versions: HeliExtend and HeliExtend Dual. The Dual version combines offset and helical scan trajectories for very high parts. Both are available as QuickScan or QualityScan. The QuickScan offers 3 to 5 times faster scanning.

Scan extensions

Our ScanExtend trajectories offer horizontal field-of-view and vertical field-of-view extensions as QuickScan or QualityScan.

Our three Vista packages.

Opening new horizons: With first class image quality and unprecedented speed, our Vista packages significantly increase productivity. Choose between three well thought-out packages with different features to meet your requirements.

Vista.

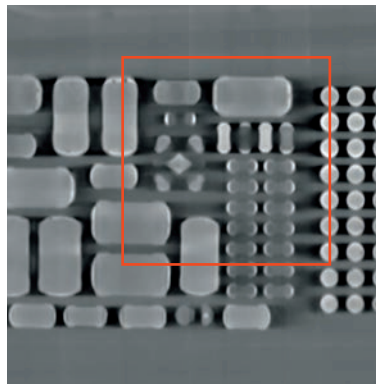
The best-in-class entry-level package. In addition to QuickScan and QualityScan it contains these features:

SpeedMode

Achieve up to three times* faster scans for parts of a flat geometry than with the classic QualityScan while keeping image detail resolution.

FlexCenter

Your ROI is not in the center of the turntable? FlexCenter provides a flexible rotation axis – no need for part repositioning.



Conventional CT scan: resolution 14 μm , 40 min scan time.



LayerScan (Vista X Pro): resolution 0.9 μm , 12 min scan time.

Vista X.

In addition to all features of the Vista package, Vista X also comprises ZoomScan offering unrivaled resolution:

ZoomScan

Increase your resolution by up to ten times* compared to QualityScan. Just combine SmartGuard with the revolutionary ZoomScan feature, and the system follows your part's exact outline. Additionally activate the SpeedMode to increase scan speed by up to three times*.

Vista X Pro.

Setting new standards in productivity: In addition to all Vista X features, Vista X Pro also contains LayerScan.

LayerScan

The Comet Yxlon computed laminography solution is the most efficient technology for highest resolution slice images of flat parts without the need for 360° rotations. Furthermore, it accelerates the scan speed by up to five times*.

* Achieved magnification and acceleration of scan times depend on the geometry of the part.

Dragonfly 3D World: next-level 3D visualization and analysis – powered by AI.

From counting to measuring, from fast segmentation to stunning visualization: Dragonfly 3D World's powerful AI-based quantification and analysis tools enable industrial users to unleash the true potential of scientific image processing.

Size, shape, and spatial properties

Make measurements on hundreds to millions of individual grains, pores, organelles, etc. Select from volume, surface area, Ferret diameter, aspect ratio, roughness, sphericity, and scores of additional measurements.

Porosity and void analysis

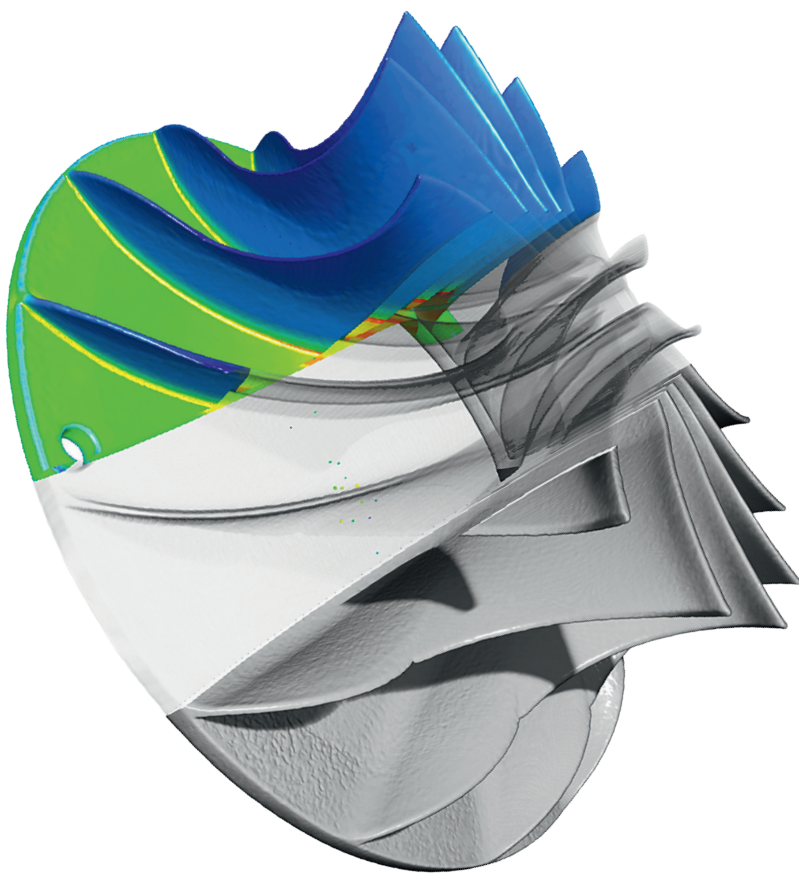
Dragonfly 3D World's automated thresholding tools enable a fast and efficient segmentation of casting or electronics parts. Porosity and voids can be calculated, visualized, and analyzed by size or volume using color coding.

Meshes and models

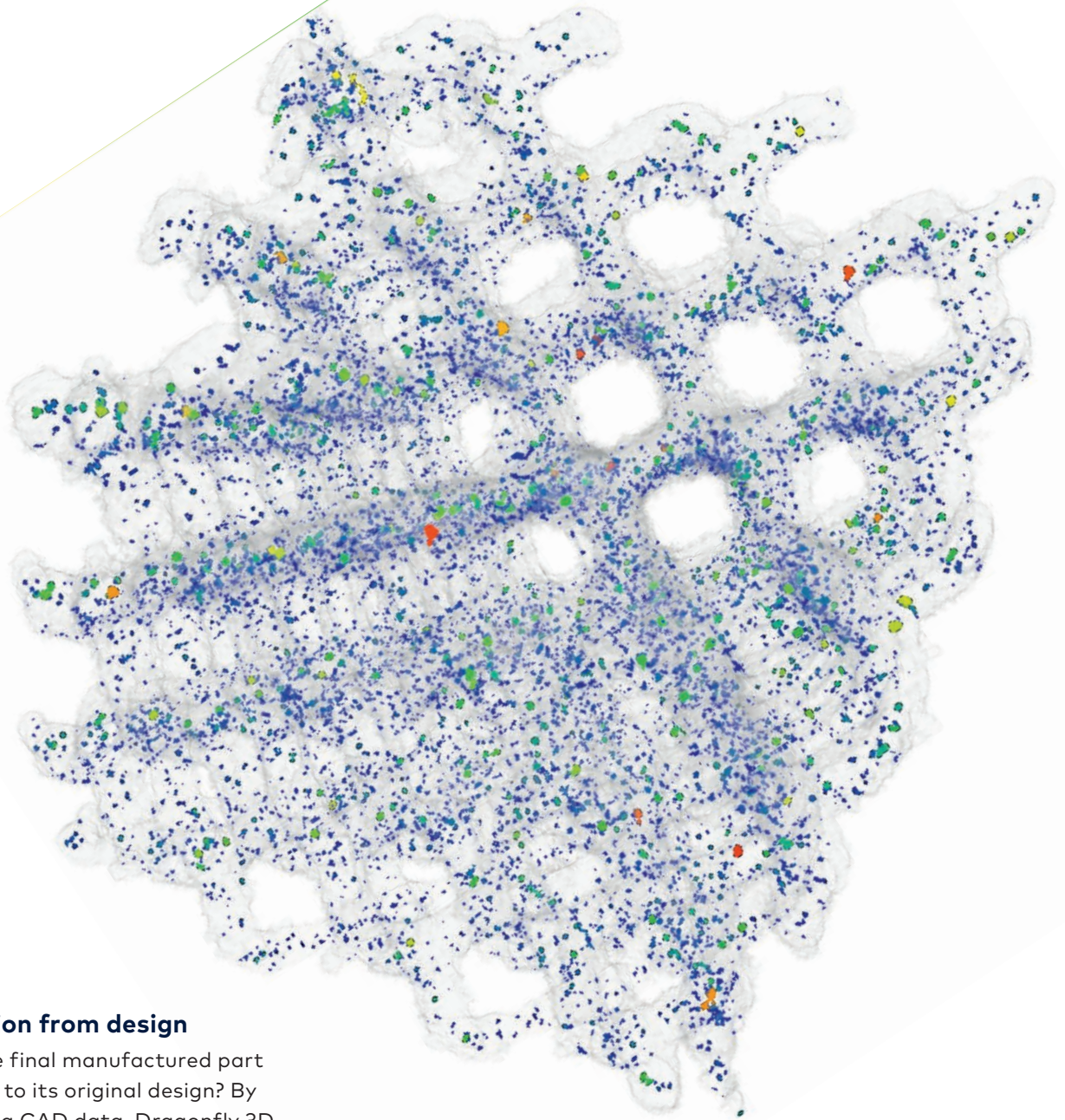
Compute high-quality surface mesh models directly from images or from segmentations.

Wall thickness analysis

Effortlessly determine the wall thickness distribution of a part and visualize it in 3D renderings. Perform statistical analysis on the results or export them for further processing.



Dragonfly 3D World allows all kind of analysis tools like porosity or wall thickness analysis.



Deviation from design

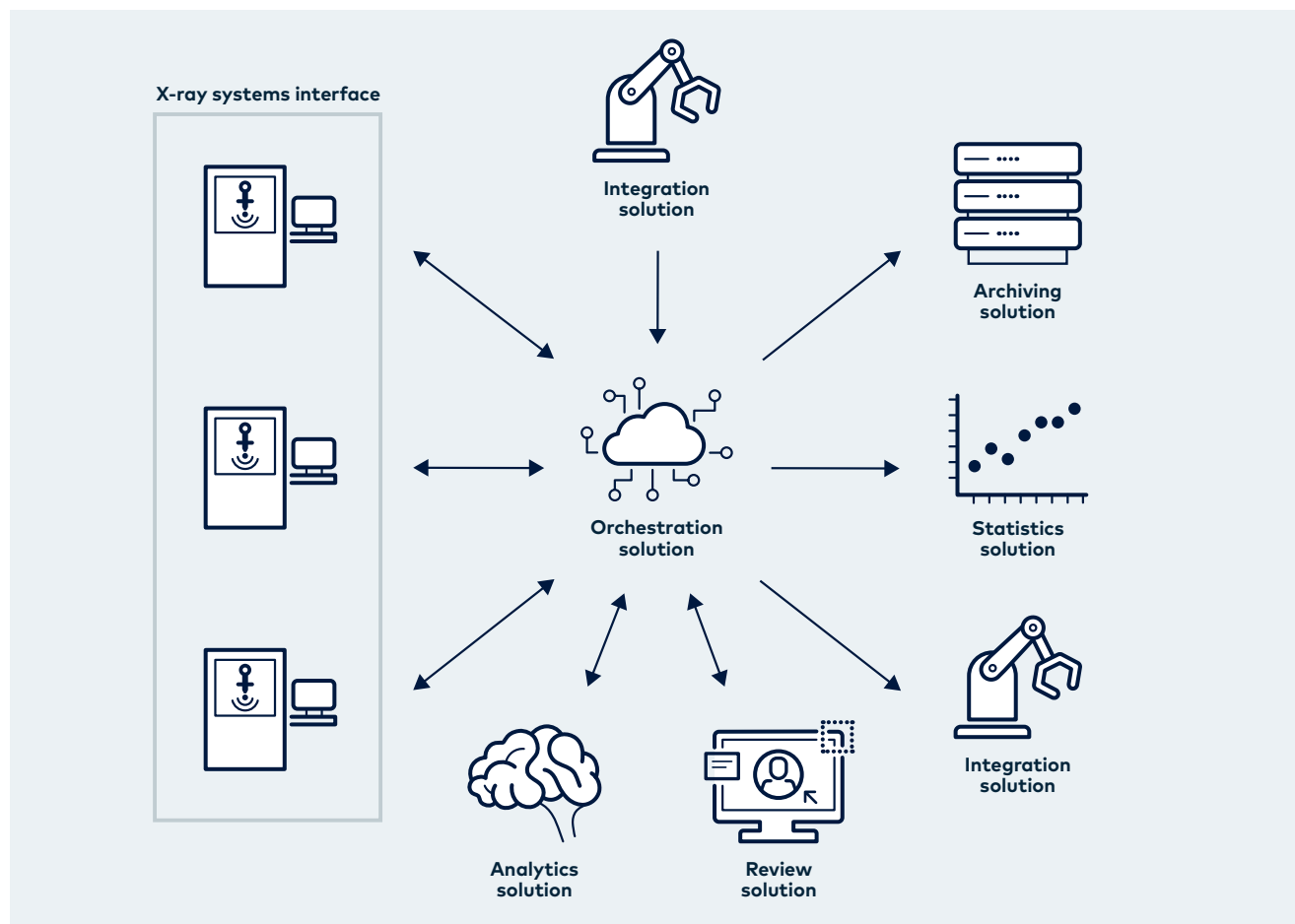
Does the final manufactured part conform to its original design? By importing CAD data, Dragonfly 3D World enables a comparison between planned design and actual part. Color coding can be used to highlight the largest deviations or warping.

Automate your analyses

With Dragonfly 3D World, many inspection tasks can be automated. Just one example: the segmentation and measurement of battery overhang distances. Deep learning based analysis tools boost the speed and efficiency of the inspection processes.

Example of high-resolution scan of a lattice structure (sample width is 6 mm for scale). The segmentation was performed using the Dragonfly 3D World automatic Otsu thresholding method.

More efficiency through connectivity and automation.



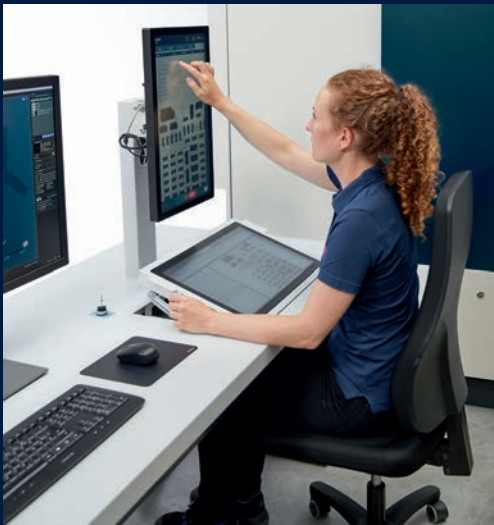
Batch Manager

Increase your automation and process efficiency by loading multiple parts into the system at the same time. Set up your inspection for one part and the Batch Manager will run it for all loaded parts. The Batch Manager is fully compatible with the other software solutions of the Comet Yxlon Software Suite.

Automatic Data Transfer

Automatic Data Transfer helps you access X-ray data from your IT infrastructure fully automatically and without compromising security. The generated data is automatically transferred to a fileserver outside of the X-ray system, which can be configured according to the local IT policy.

Ergonomic. Intuitive. Accessible.



In the FF35 CT, software and hardware work hand in hand to make system operation as easy as possible. The clean layout of the operator desk with tiltable touchscreens allows users to stay focused on the inspection task. The height of the desk can be adjusted, facilitating operation from a sitting or standing position. Healthmonitor and push messages keep the user informed about system status and inspection progress at all times.



Gemini's Healthmonitor shows the current system condition.

Our supportive Life Cycle Service.

At Comet Yxlon, service is not an add-on, but an integral part of every product. We support you through the entire life cycle of your system – for easy operation and extended product life.

Offline applications, at-line scenarios, or in-line implementation – Comet Yxlon supplies tailored service solutions for a wide range of production environments. Whether you are an X-ray beginner or a CT expert, whether you need introductory training or a performance upgrade: Our service team is here to support you.

1. Getting you started

Our professional Comet Yxlon field service technicians or certified service providers will ease your way into working with your new inspection system.

- Bringing the system to life: installation & commissioning
- Power on: introductory training by Comet Yxlon Academy
- Correct measurements from the start: SmartCalibration
- Cost transparency from the beginning: flat fee service rates

2. Running things smoothly

Is there an issue? No problem. Our skilled service technician team helps with troubleshooting, maintenance, and part exchange for easy operation.

- High efficiency thanks to remote control and VisualAssist
- Professional phone support and on-site visits
- Preventive maintenance and SmartExchange
- High-end system monitoring with SmartCalibration

3. Enhancing performance

With our upgrades and conversion kits, your Comet Yxlon system remains in top-notch condition and keeps its value as market demands change.

- System release upgrades, feature & performance upgrades
- Component upgrades
- System software upgrades
- Advanced Academy training

Tailor-made Service Level Agreements

Our Service Level Agreements are based on different performance factors, e.g.

ServicePass – for fast reaction times and seamless maintenance

SmartPass – focusing on the highest possible system availability

LifeCyclePass – the all-inclusive premium contract for guaranteed life-cycle-costs

Please contact us to learn more about the specifics of our different service contracts!

FF35 CT in numbers.

Inspection parts

Max. part size (Ø x H)	530 mm x 800 mm ¹⁾	
Max. inspection envelope 3D (Ø x H)	420 mm x 640 mm or 250 mm x 670 mm (for 3131 N)	530 mm x 610 mm or 340 mm x 665 mm (for 4343 CT)
Max. part weight	up to 50 kg	

X-ray source

	FXT-225.48	FXT-190.61	FYT-160.NFX1.600
Tube type	microfocus, open	nanofocus, open	nanofocus, open
Energy range	20 - 225 kV	20 - 190 kV ²⁾	20 - 160 kV
Focal spot size	6 µm	<1 µm	<1 µm
Spatial resolution ³⁾	4.0 µm	0.6 µm	0.6 µm
Features	TXI ⁴⁾	TXI ⁴⁾ , multifocus, cooled	LaB6 emitter

Detector

	Flat-panel detector 3131 N	Flat-panel detector 4343 CT
Active area	307 mm x 307 mm	432 mm x 432 mm
Pixel matrix	3,072 x 3,072	2,880 x 2,880
Pixel pitch	100 µm	150 µm
Max. frame rate	75 fps	30 fps

Manipulation

Focus-detector distance (FDD)	up to 1,170 mm
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Cabinet / System

Dimensions (W x D x H)	2,960 mm x 1,590 mm x 2,120 mm (w/o levelling wedges)
Weight	~ 6,800 kg (single tube setup) / ~ 6,900 kg (dual tube setup)
Loading door clearance (W x H)	650 mm x 790 mm
Mains connection	3-phase 230 / 400 V AC ±10 %, 50 / 60 Hz, zero, ground; transformer available
Max. power consumption	2.1 kVA

Options

	FF35 CT Metrology ⁵⁾	FF35 CT Semi
	Systems ambient conditions correspond to measuring room quality class 4. Measurement uncertainty MPE SD ⁶⁾ is 5.9 µm + L/75 [L = mm].	Fulfills SEMI® standards SEMI® S2-0818 & SEMI® S8-0218. It is certified accordingly and is equipped especially for semiconductor applications.

¹⁾ Collision-protected by manual definition of cylinder. ²⁾ For local requirements, FF35 CT energy range may be limited via hardware to max. 160 kV.

³⁾ Measured with JIMA RT RC-02B or HiCo micro-chart test specimen. Acceptance criteria CNR*MTF > 5 %; MTF > 5 %; CNR > 0.5. ⁴⁾ TXI = true X-ray intensity – controls real output dose for constant intensity. ⁵⁾ Does not feature virtual rotation axis FlexCenter. ⁶⁾ Referring to VDI / VDE 2630 part 1.3. Measured as deviation of sphere distance in tomographic static mode (TS) with std. circular scan. Values valid only for FF35 CT Metrology under compliance with conditions described. More details on request.

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