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## Y.Cheetah Experience brilliance in any job!



Continuous miniaturization and increasing demands for quality and reliability drive the need for high resolution inspection tools. As a leading supplier of industrial X-ray inspection systems for microfocus and non-destructive testing, YXLON International is taking up this challenge. Across various domains, including electronics, micro-systems, assemblies and materials, product integrity can be ensured through deployment of the Feinfocus product family – high performance X-ray solutions optimized for the use in research and development, prototyping, failure analysis, process monitoring and higher volume production testing.

Y.Cheetah is the advanced and versatile Feinfocus X-ray Solution especially designed for 1-click operation at high performance. Y.Cheetah offers unmatched image quality and manipulation flexibility including high volume inspection tasks. YXLON. The reason why.

- Secure your findings with brilliant X-ray images
- Any task in your daily routine solved quickly
- 1-click solutions



YXLON. The reason why



## Y.Cheetah X-ray solution

Designed to meet a wide range of rigorous needs of the electronics, automotive, telecom, medical devices, military and aerospace industries, the versatile Y.Cheetah offers unmatched high-level performance at previously unknown ease of operation. The comprehensive expertise acquired by FeinFocus – the pioneer of microfocus X-ray inspection technology with more than 2500 system installations worldwide – steered the development of the high-end versatile inspection solution, the Y.Cheetah.

The result is a high performance X-ray solution that is easily adapted to continuously changing inspection needs. An unmatched manipulation concept supported by smart technological solutions for 1-click operation lead to ultimate system flexibility and highest quality imaging.

The Y.Cheetah system is the most efficient solution for advanced yet effortless real-time microfocus inspection ranging from manual single part to automated series applications.

## Flexibility and Versatility

Tailored to customer needs through a wide range of configurations, the Y.Cheetah addresses changing inspection needs with retrofitable modules and components and prepares for the unexpected via customized and future inspection modules. The system enables fast two-dimensional inspection and three-dimensional microfocus computed tomography ( $\mu$ CT) in:

- Failure analysis and R&D
- Process and quality control
- Batch, series, and production inspection

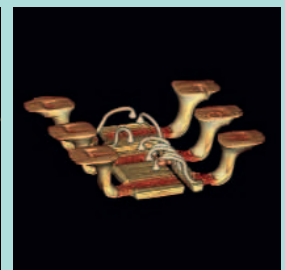
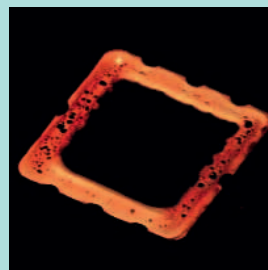
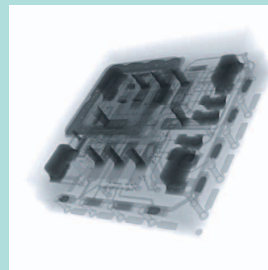
### Applications

- Printed Circuit Boards (PCB)
- Semiconductor packages and interconnects
- Electronics and mechanical assemblies
- Electromechanical components and connectors
- Encapsulated components and modules
- Microsystems, sensors, actuators, MEMS, and MOEMS
- Medical devices, pharmaceutical specimen, and photonics

### Supporting features and functions

Unmatched accessibility and technological solutions support the operator in any inspection task through:

- Large automated door for fast and easy loading
- System reconfigured and referenced in < 1 minute
- Unobstructed view through large window
- Collision free single part inspection for safe operation
- Grid Inspection for fast application to multiple parts
- Y.QuickScan – the ultra fast  $\mu$ CT solution (option)
- Y.T&R Module for tape and reel inspection (option)



Micro gear box in 2D view and 3D slice

Venous catheter in 2D view and 3D view

System-in-Package with voiding in 2D view and 3D slice

Inspection of small SOIC in 2D view and 3D view



## Brilliant images

High performance imaging is the basis for the detection and analysis of minute hidden details in microfocus X-ray inspection. The Y.Cheetah reliably provides highest quality inspection results through leading edge imaging components.

### ■ Feinfocus open transmission tube technology

- Unlimited lifetime and flexibility in application
- 160 kV microfocus tube with 64 W tube power
- Multifocus X-ray tube (MFT) offering microfocus ( $\mu\text{f}$ ), nano-focus ( $\text{nf}$ ), and High Power (HP) modes (option)
- Detail detectability down to  $< 500 \text{ nm}$
- True X-ray Intensity (TXI) technology achieving sharp, consistent image quality throughout the inspection
- High-Power Target for even sharper and faster images of dense or low-contrast materials at high power

### ■ Unmatched manipulation concept

- Twin magnification axis for ultimate flexibility
- Zoom\* for advanced magnification control keeping grayscale resolution and contrast at optimum level
- PowerDrive for higher quality images in shorter time
- High precision manipulation for spatial measurements
- Air suspension of entire image chain incl. manipulator

### ■ High-speed flat panel detector

- Distortion free high-speed flat panel detector
- Large field of view visualized on 24" monitor
- High quality, medium quality, and real-time modes for maximum flexibility at up to 30 frames per second
- Real-time imaging with 16 bit processing

## 1-click solutions

Designed to bring the highest quality images to any operator, the Y.Cheetah introduces a range of 1-click solutions that allow rapid inspection deploying even the most advanced technological functions at the touch of a button.

### ■ Manual inspection

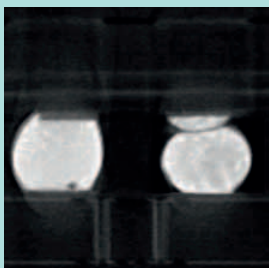
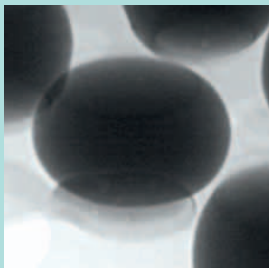
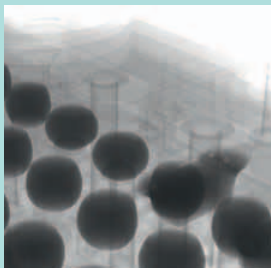
- 1-click to first image in  $\sim 10$  seconds after loading
- "Click & Center" – global or fine sample manipulation upon 1-click in overview image or X-ray image
- "Frame & Zoom" – 1-click to zoom and position sample
- "Click & Fly" – inspection under motion, for tracking BGA-balls or component reels including speed control
- Inspection History – 1-click access to previous images and settings and to dedicated presets<sup>1</sup>
- Inspection Map – 1-click reporting in overview image<sup>1</sup>
- 1-click to generate image report

### ■ Software guided manual inspection

- Inspection Recipe – 1-click manual pass/fail/warn decisions for an automated sequence of X-ray images<sup>1</sup>
- Inspection Map – 1-click to activate automated reporting in overview image<sup>1</sup>

### ■ Automated inspection

- 1-click access to a library of automated inspections
- Grid Inspection for 1-click series application
- Easy Teach-In for code free training of inspections
- Automatic defect recognition (ADR) software for customized solutions (option)
- $\mu\text{CT}$  Workspace with 1-click execution (option)

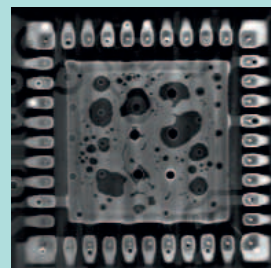
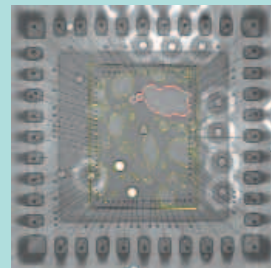


Visualization of head-on-pillow defects in 2D view and 3D view

Close-up of head-on-pillow defects in 2D view and 3D slice



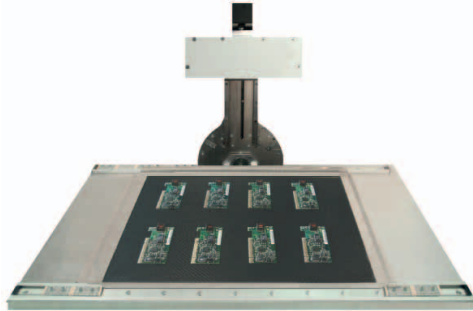
Inspection of SMT inductors in 2D view (top) and 3D slice (bottom)



Die attach analysis in 2D view (top) and 3D slice (bottom)

## Y.Cheetah for 2D inspection

Ideally suited for manual single part up to automated series inspections, the Y.Cheetah is the perfect solution for effortless and fast X-ray inspection. Sample trays are loaded via the large door and 1-click provides the first X-ray image in ~ 10 seconds. The system is controlled via mouse or joystick. The operator can be guided through a sequence of pass/fail decisions via Inspection Recipes<sup>1</sup>. A choice of automated FNC inspection routines can be started comfortably via 1-click.

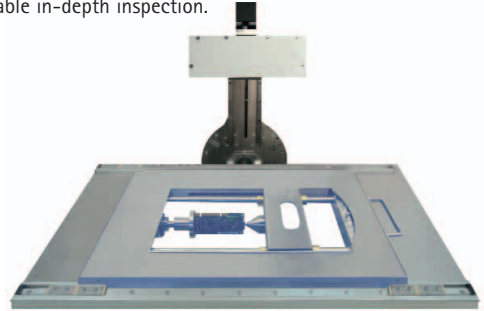


Maximum flexibility and image quality is achieved through unmatched manipulation and leading edge imaging components. Effortless smart control accessible to any operator ensures highest quality inspection results at speed.

- Twin magnification axis with tube and detector Z-axes operating in Zoom<sup>+</sup> and PowerDrive modes
- 140° detector tilt for oblique views
- Sample tray X/Y manipulation
- Sample rotation table 360° incl. sample holders (option)
- Rotate and tilt device 360°/60° (option)

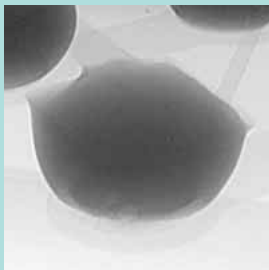
## Y.μCT Module and Y.QuickScan

The Y.μCT Module gives real insight into the three-dimensional composition of a sample including virtual cross-sections and slices and measurements. A universal sample holder with sliding counter bearing ensures fast and accurate sample positioning. Manual setup is a matter of seconds and scan protocols are easily accessible for direct reuse. Projections are acquired over 360° sample rotation. Reconstruction within a couple of minutes and visualization in CAD-like environment enable in-depth inspection.

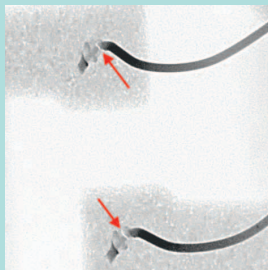


The particularly successful Y.QuickScan in combination with PowerDrive technology and 1-click execution of μCT scans enables series inspection at previously unexpected throughput. The Y.μCT Module offers:

- Complete system reconfiguration within < 1 minute
- Y.QuickScan for fast μCT scans in down to 8 seconds and reconstruction within a couple of minutes
- μCT manipulator with high accuracy sample rotation
- Easy-to-use visualization and reconstruction software
- Reconstruction and visualization workstation



BGA in oblique view, and automatically analysed



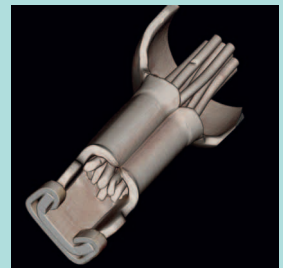
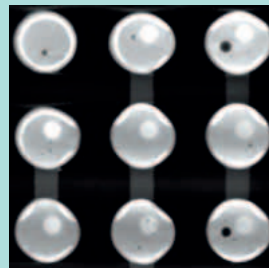
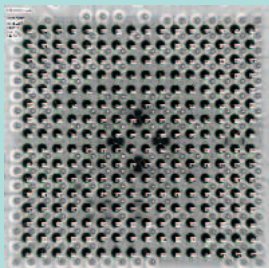
Broken wedge bonds, and crimp connectors



Micro-crack, and thin slice in BGA inspection



Y.QuickScan of bond wires, and crimp connector



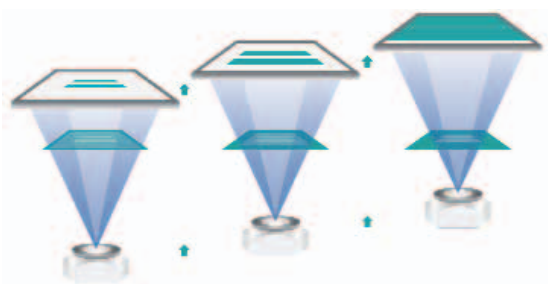




## Zoom+

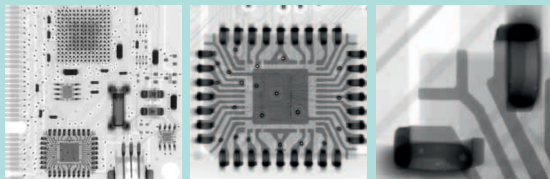
Y.Cheetah provides ultimate flexibility in magnification control deploying a twin magnification axis. In Zoom+ mode:

- Tube and detector axis are driven into the same direction synchronously at constant focus to detector distance
- X-ray intensity remains constant maintaining optimum grayscale resolution – whatever magnification
- Time-consuming tube adjustments and detector calibration are avoided
- Highest image quality is maintained

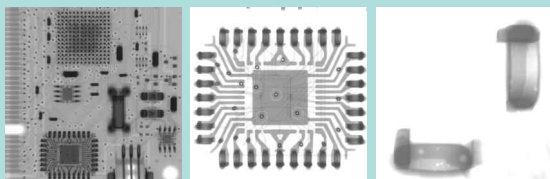


Images below compare the Zoom+ technology to conventional systems at different magnifications for a printed circuit board, one particular QFP component, and two of its pins. Without tube and detector adjustments, Zoom+ offers key benefits:

- 1-click to provide brilliant images throughout inspection
- No tube or detector adjustments
- No degrading software interpolation
- Faster inspection
- Superior image quality
- Effortless operation accessible to any operator



Low magnification  $\xrightarrow[\text{Conventional}]{\text{Zoom+}}$  High magnification

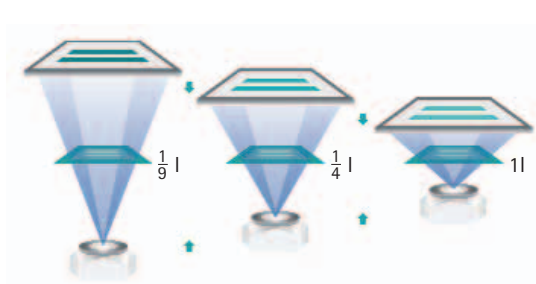


Zoom+ for ideal and constant contrast across magnification range (top) compared to conventional systems (bottom)

## PowerDrive

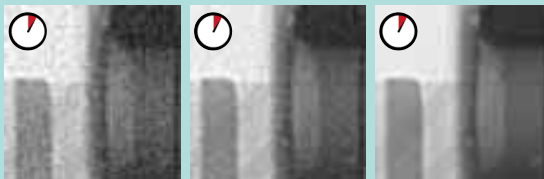
The twin magnification axis allows controlling X-ray intensity and power in image acquisition. In PowerDrive mode:

- Tube and detector axis are driven synchronously into the opposite direction at constant geometric magnification
- X-ray intensity quadruples at halved focus to detector distance (inverse square law:  $I \propto 1/r^2$ )
- Reducing the focus to detector distance has the same effect as either integrating images for noise reduction or increasing target current and X-ray intensity

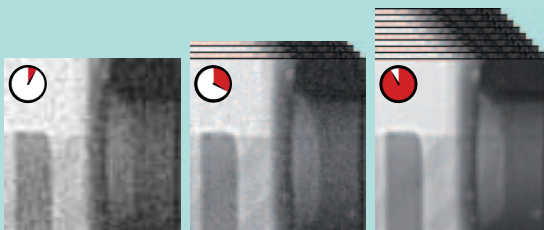


Images below illustrate increasing image quality for PowerDrive and conventional systems (cropped and enlarged minute segments of the QFP image on the left). PowerDrive provides:

- Unmatched effective power increase for brilliant images
- Faster image acquisition with ultimate speed of Y.QuickScan in  $\mu$ CT applications
- Flexibility to address most challenging inspections
- Inspection at reducing distance and lower tube power
- Identification of individual sample layers under motion
- Easy operation saving inspection time



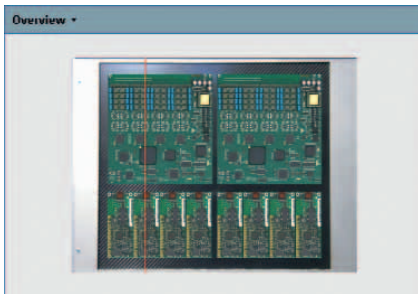
Noisy image  $\xrightarrow[\text{Conventional}]{\text{PowerDrive}}$  High quality image



Comparison PowerDrive (top) and conventional systems (bottom) using cropped and enlarged parts of QFP image

## Y.FGUI

The Y.FGUI (Feinfocus Graphical User Interface) offers an ideal solution for both, easy 1-click operation and advanced system control. Emphasis is placed on real-time X-ray imaging and processing. Effortless software control of smart manipulation techniques enable any operator to take images of outstanding quality and brilliance in shortest inspection time. Easily associated icons and controls, supported by clutter-free workspaces enable intuitive usage and fast operator training.



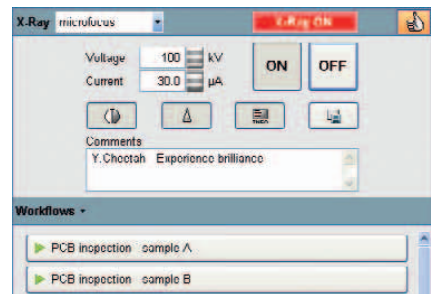
### Overall structure

The large real-time X-ray image offers 1-click manipulation. It is accompanied by ergonomically separated workspaces for the Easy-View,  $\mu$ CT, and AXI operator modes, advanced image processing and CNC teaching, display of manipulation details and advanced tube and system control. Main tube parameters are controlled at the common upper workspace region. The overview image offers 1-click manipulation and 1-click reporting in the form of an Inspection Map<sup>1</sup>.

### Easy-View Workspace

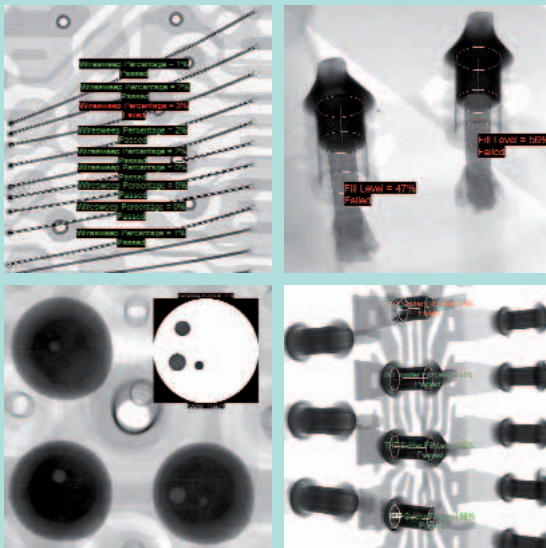
The workspace provides all controls for simple system operation across many inspection tasks:

- Control of main tube settings
- Automatic contrast and sharpening on/off
- Display settings in X-ray image with freely editable text
- Save image
- Access to a library of CNC inspection workflows
- Inspection History<sup>1</sup>, Inspection Map<sup>1</sup>, Inspection Recipe<sup>1</sup>

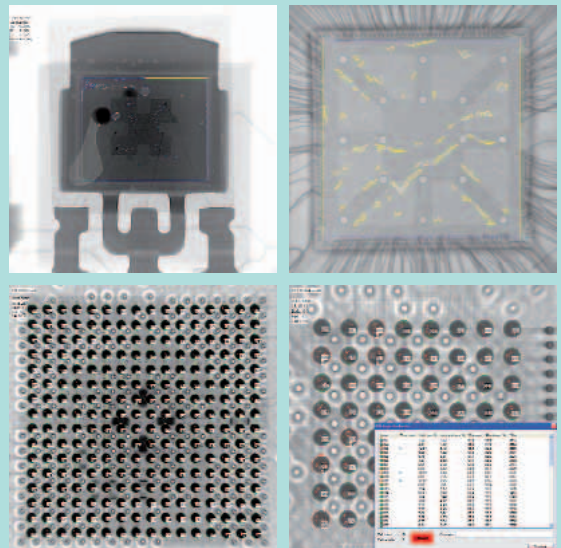


### Image Process (IP) Workspace

- Straightforward drag & drop composition of image chain and adjustment of operator parameters
- Easy-to-use operators and analysis tools as standard including contrast, sharpening, average, OSD with spatial, wire sweep, and THT measurements, etc.
- Additional optional operators for image analysis (BGA, voiding calculation) supported by configuration wizards
- Control of detector settings
- Ergonomic arrangement for all typical inspection tasks



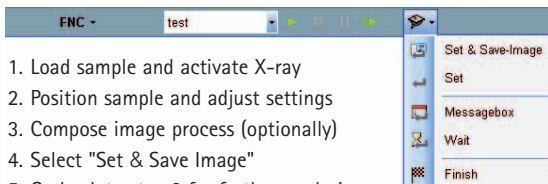
Measurements for wire sweep, barrel fill (THT), and BGA voiding in single ball



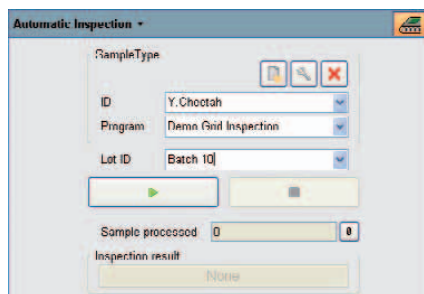
Automatic analyses: voiding calculation, and BGA analysis



## ■ Easy Teach-In



1. Load sample and activate X-ray
2. Position sample and adjust settings
3. Compose image process (optionally)
4. Select "Set & Save Image"
5. Go back to step 2 for further analysis
6. Select "Finish" in Teach-In menu



## ■ AXI Workspace

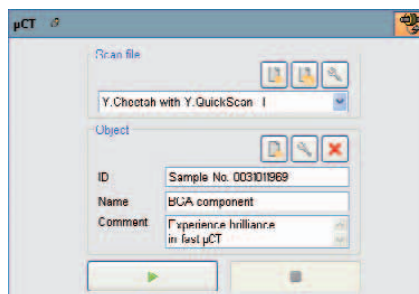
A trained inspection program can be applied to multiple samples using the Grid Inspection accessible in the AXI workspace:

- 1-click operation for fast series inspection of numerous trays – each holding multiple parts
- Access to a library of samples and inspection routines
- Visualization of pass/fail results from image analyses
- Automated reporting of inspection results
- Fast setup – simply defining number of cells, X/Y pitches, and the inspection routine to be applied

## ■ $\mu$ CT Workspace

The workspace provides access to predefined  $\mu$ CT scans and guides the operator during the configuration of new scans:

- 1-click access to library of scan routines
- 1-click execution of  $\mu$ CT scans for fast series inspection
- Optional entry of object ID, name, and comment
- $\mu$ CT wizard to support setup of new  $\mu$ CT scans
- Automated identification of Y. $\mu$ CT Module enables the  $\mu$ CT Workspace



## ■ 3D reconstruction and visualization

The Y. $\mu$ CT Module includes a dedicated workstation for reconstruction of 3D data and its visualization:

- Fast online and offline reconstruction
- Intuitive to use visualization in a CAD-like environment
- Reconstruction and visualization of region-of-interest scans to achieve maximum resolution and magnification
- Virtual slices and cross-sections at any arbitrary angle
- 1-click application of visualization templates
- 1-click reporting to visualization scenes and saved views

