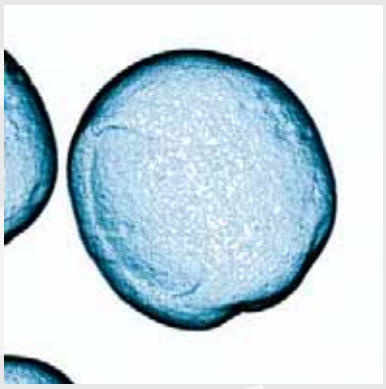
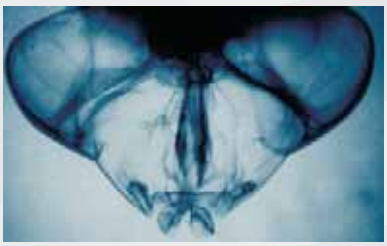
20 Years of X-cellence

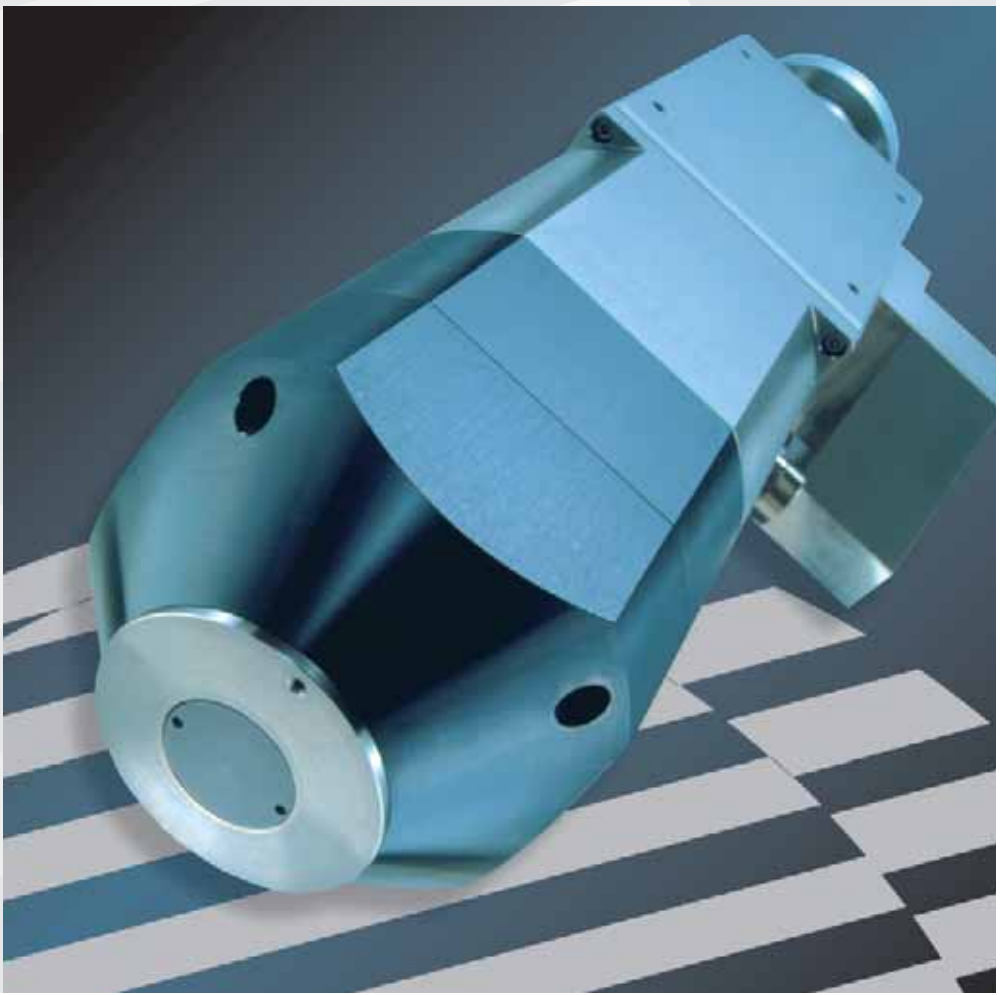
FEIN FOCUS

Pioneers in X-ray Inspection

More Than Just X-Ray Technology





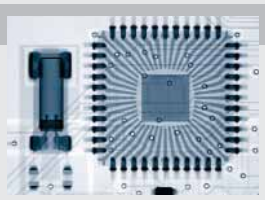


Industries and Applications

Pioneers in X-ray Inspection

ELECTRONICS

Surface Mount Technology



OPTOELECTRONICS

Fiberglass Connectors

CERAMICS

Soldered Ceramics

AIRCRAFT / AEROSPACE

Weldings, Cracks

AUTOMOTIVE

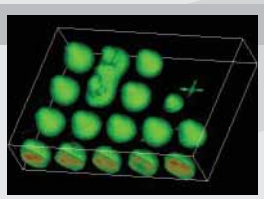
Glow Plugs, Injectors, ABS Sensors

NDT

Die Castings, Weldings, Mouldings

CT (COMPUTER TOMOGRAPHY)

Complex 3D Structures



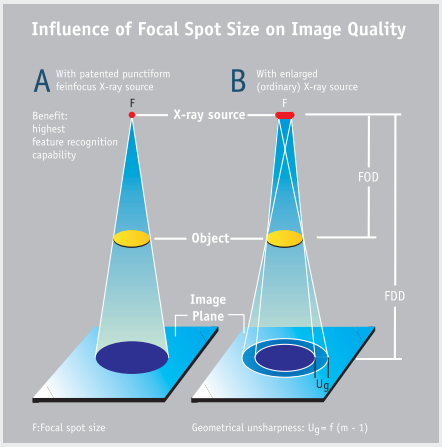
MEDICAL

Medical Device Technology

Pioneers in X-ray Inspection

Microfocus X-ray Tubes

Open (FXE) and Sealed (FME) Tube Designs



FEINFOCUS is the unrivaled pioneer of microfocus X-ray technology. The first open microfocus X-ray tube with a focal spot size of < 5 µm that was suited for industrial use was developed and patented in 1982 by Alfred Reinhold, company founder and Technical Managing Director.

FXE - Open X-Ray Tube Design

All FEINFOCUS FXE X-ray inspection products consist of a demountable X-ray tube assembly, vacuum unit, and high-power generator. The required maximum magnification, sample size and material to be inspected determine the radiation head and radiation power employed. FEINFOCUS offers a broad range of micro- and multifocus X-ray tubes that guarantee a versatile use in almost any field of application, featuring:

- various tube head designs:
  - **transmissional heads** for highest magnifications
  - **directional heads** for high-power applications
  - **scanning tubes** for specific 3D applications
- up to 999 programmable focal spot positions
- a wide power range (kV)

Unique features, such as the optional **MFT** (Multifocus Tube) design and the **TXI** (True X-ray Intensity control) functionality are only a few features that make FEINFOCUS X-ray tubes first choice when selecting the right tube technology for your specific inspection requirements.

Well-known international market leaders as well as numerous manufacturers of all industries - particularly electronics, automotive, and aerospace - have successfully used FEINFOCUS X-ray products for years. To date, almost 2,000 FEINFOCUS inspection systems and X-ray tubes have been successfully installed worldwide.

FXE - Open Tube Features:

- Unlimited life-time due to open-tube design
- Min. focal-object-distance for highest magnifications
- Automated system start-up and tube conditioning
- True X-ray Intensity control (TXI)
- Long-term intensity and focus position stability
- Program for filament life-time extension
- Easiest target and filament replacement due to modular design
- Intelligent controller software
- Various options, e.g. shutter functionality, collimator, conical target, etc.

FME - Sealed Tube Features:

- Ideal for portable and stationary use in the field
- Small dimensions, low weight
- Automated system start-up and tube conditioning
- Perfect price-performance ratio

Other FEINFOCUS Features:

- Microprocessor-based control of all relevant parameters to ensure optimal performance (focal spot size, filament current, electron beam, etc.)
- X-ray program storage for recurring applications
- Intelligent operating software FXE-Control for easy configuration and operation

MFT

The Multifocus Tube design provides three operating modes within just one tube ("3 in 1"):

- nanofocus mode (*nf*)
- microfocus mode (*µf*)
- high-power mode (*hp*)

The microfocus mode is chosen for typical microfocus applications, whereas the nanofocus mode operates in the low kV-range for highest magnifications. The high-power mode results in an increased electron density on the target best suited for the inspection needs of denser samples.

TXI

TXI (True X-ray Intensity control) ensures a constant, controlled output level of X-ray intensity from system start-up to shut-down. The result is a consistent and sharp X-ray image throughout each time inspections are carried out.

Advantages:

- long-term stability of X-ray intensity
- constant and highest image quality

Because TXI technology ensures a constant level of X-ray intensity, it is well-suited for production environments, CT scanning, and other applications where a large number of images are taken over a certain period of system operation.

Micro-, Nano- and Multifocus X-Ray Tubes -
FXE and FME Series for *Your* OEM Applications

How to select the right tube technology:

Transmission tubes for	Directional tubes for	Scanning tubes for
● highest geometric magnification ● smallest focal spot sizes	● high energy ● high power output ● penetration of dense material	● laminography and tomosynthesis ● µCT applications ● large scanning areas

X-ray inspection as a valuable quality assurance tool is well established in many industries today. Whether as a stand-alone solution or as complementary technology integrated in other systems, the demand for X-ray inspection is ever increasing.

FEINFOCUS offers a wide range of X-ray tubes particularly suited for OEM applications. Both series, the FXE (open tube design) as well as the FME (sealed tube design), can be adapted to ***your*** specific requirements in order to perfectly meet ***your*** needs. The modular concepts of the control unit as well as the operating software FXE-Control guarantee an easy adaption and implementation of the tube into ***your*** system. All functions and parameters of the X-ray system can be easily adjusted, monitored and stored.

FXE/FME - Typical OEM Applications:

- Implementation in stand-alone AXI systems
- Implementation in multilayer drilling machines
- Combination of AOI and AXI capabilities within one system
- Medical inspection systems
- X-ray rooms and application labs
- Laboratories

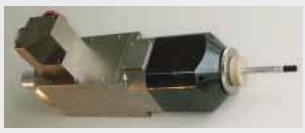
FXE-Control Features:

- Automatic start-up / warm-up for ease of use
- TXI (True X-ray Intensity control) function
- Nanofocus, microfocus and high-power mode (MFT)
- Filament lifetime optimization
- Auto- and/or manual centering
- Control and optimization of vacuum, radiation, and tube current parameters
- Implementation of ***your*** company logo

Accessories

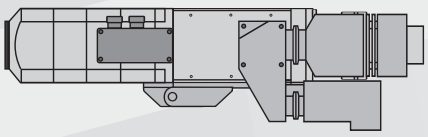
Rod Anodes:

- Custom-designed length
- Custom-designed diameter
- Beam configurations:
  - 360° panoramic
  - 180° directional
  - 40° directional cone

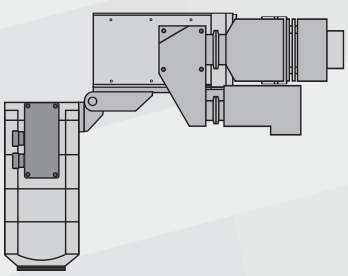


Customized Tube Head Design ...

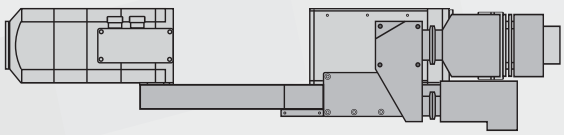
... the tube



... with hinge



... with slide



Pioneers in X-ray Inspection

Technical Data

Micro- and Multifocus X-Ray Tubes

X-Ray Tube Type FXE (open tube design)			
Tube head	transmission	directional	scanning
Multifocus Tube design (MFT)	option	option	option
kV-range	up to 225	up to 225	up to 225
mA-range	0.001 - 1.0	0.001 -3.0	0.001 - 1.0
Target power	up to 10 W	up to 320 W	up to 40 W
Feature recognition	down to 0.3 µm	< 2 µm	< 10 µm
Beam cone angle	170°	40°	150°
Focal spot scanning area	-	-	max. 3" (75mm)*
Focal spot positioning frequency	-	-	200 Hz
True X-ray Intensity control (TXI)	yes	yes	yes
Filament lifetime	200 - 1500 h	200 - 1500 h	200 - 1500 h
Target material	W*	W*	W*
Internal shutter	option	option	option

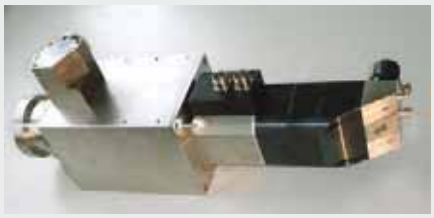
* others on request

X-Ray Tube FME (sealed tube design)	
Tube head	directional
kV-range	5 - 80
mA-range	0.01 - 1.0
Feature recognition	5 µm
Beam cone angle	40°
Target material	W*

* others on request

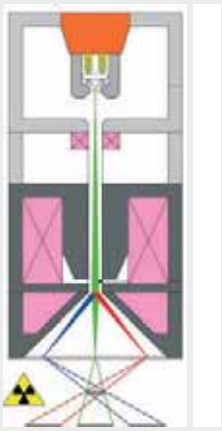
Accessories	
Rod anodes	Image processing unit
Collimator	Flat panel detector (**DDD**)
Conical target	Video printer
Image intensifier	

Transmission tube head



Directional tube head

Scanning tube head



Applications

Tube	Semiconductor	Electronics	Optoelectronics	Micromechanics	Automotive	Ceramics	Sensors	Plastics, Composites	NDT	Aerospace	Medical	µCT
FXE Transmission Tube	●●●	●●●	●●●	●●●	●●	●●●	●●	●●●	●●	●●	●●●	●●●
FXE Directional Tube	●●	●●	●●	●●	●●●	●●●	●●●	●●	●●●	●●●	●●	●
FXE Scanning tube	●●●	●●●	●●		●	●	●	●			●●●	●●●
FME	●	●	●	●	●	●	●●	●●	●●	●	●	

● well suited ●● very well suited ●●● ideal, perfectly well suited

Sophisticated
FEINFOCUS Inspection Solutions

Pioneers in X-ray Inspection

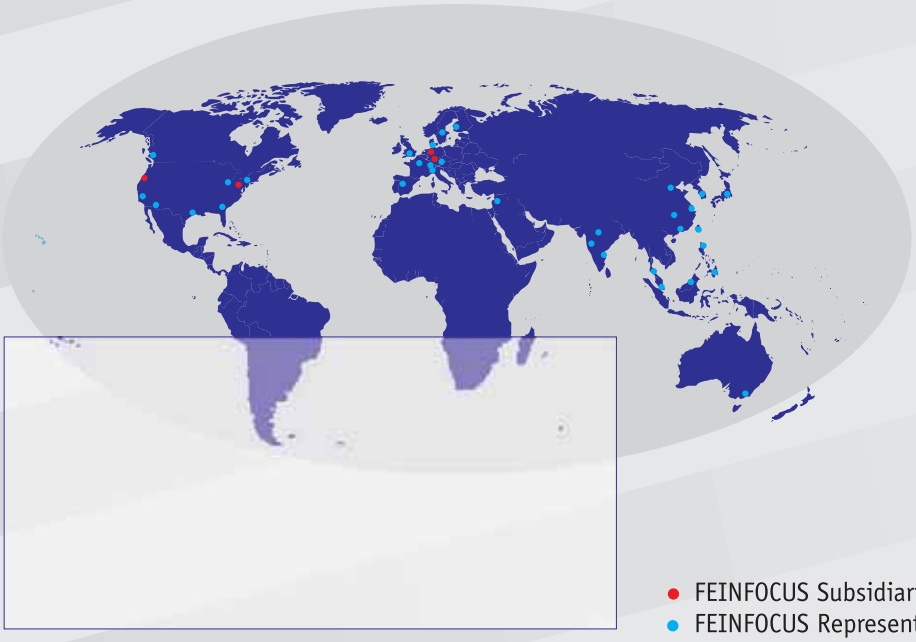
Apart from X-ray sources, FEINFOCUS offers a broad range of complete system solutions for numerous applications in industry and research, as well as X-ray inspection and analysis services.

The **TIGER system** (FXS-160.40) was designed for the rigorous inspection needs of the PCB, semiconductor and electronics industries. Outstanding features are oblique angle viewing at highest magnification, and fast and easy operation. The system's proprietary AIM (Auto Isocentric Motion) keeps the region of interest (ROI) clear and within the field of view at any level of magnification and tilt or rotation angle without readjusting of the sample.

The award-winning **FOX system** was designed for the ultra-high magnification and precise measurement that is required in the PCB and semiconductor industries, combining latest tube technology with a high-precision manipulation system. The FOX is also available with CT capability (µCT FOX) or as wafer bump inspection system (WBI FOX).

The well-established **.20 and .30 system series** are typically utilized for a variety of inspection tasks both in electronics production and lab environments. Whereas **systems series .50 and .70** are typically best suited for applications in the automotive and metal-working industries, the **µ-3D Visualiser** provides valuable insights into the 3-dimensional structures of electronic devices, interconnection techniques and PCB's.

Well-known international market leaders as well as numerous manufacturers of all industries have successfully used FEINFOCUS X-ray inspection equipment for more than 20 years now. Our sophisticated technology provides the sharpest images and deepest insights - look closer! Try us!



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