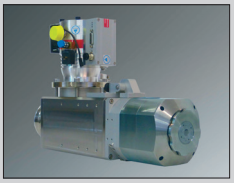
X-RAY WORX

MICROFOCUS X-RAY TUBES - PRODUCT LINES

Microfocus Transmission Tubes

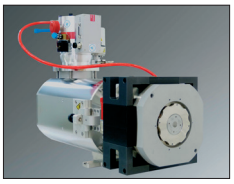


Resolution ★★★★☆ 2.0 µm
Power ★★★☆☆ 10 Watt
Magnification ★★★★★
Applications 2D

Product line *T* - high resolution microfocus tubes

Product line *T* is recommended for two-dimensional (2D) inspections in electronics, automotive, and medical industry.

Two microns JIMA resolution and up to 10 Watt target power cover the requirements of various high resolution applications.



Resolution ★★★★☆ 2.0 µm
Power ★★★☆☆ 25 Watt
Magnification ★★★★★
Applications CT PCT DM IN

Product line *THE* - microfocus tubes with *High Energy Target*

Product line ***THE*** is recommended for computed tomography (CT), planar computed comography (PCT), dimensional measurement (DM), and inline inspection (IN) in automotive, electronics, and medical industry.

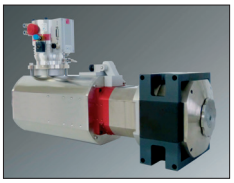
Outstanding 25 Watt target power and ultimate combination of resolution, intensity, and magnification, featuring the ***High Energy Target***.

Resolution ★★★★☆ 2.0 µm
Power ★★★★☆ 50 Watt
Magnification ★★★★★
Applications CT PCT DM IN

Product line *THE Plus* - microfocus tubes with 50 Watt target power

Product line ***THE Plus*** is recommended for computed tomography (CT), planar computed tomography (PCT), dimensional measurement (DM), and inline inspection (IN) in automotive and aerospace industry.

Outstanding 50 Watt target power and the ultimate combination of resolution, intensity, and magnification, supported by the innovative cooling of the transmission target, featuring the ***High Energy Target***.



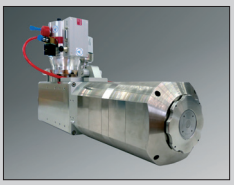
Resolution ★★★★★ 0.9 µm
Power ★★★☆☆ 10 Watt
Magnification ★★★★★
Applications CT HR

Product line *TC* - highest resolution microfocus tubes

Product line ***TC*** is recommended for computed tomography (CT) and high resolution inspection (HR) in electronics and medical industry.

JIMA resolution of 0.9 microns (µm) and three modes of operation: Nanofocus, Microfocus, High Power mode.

Up to 25 Watt target power using the optional ***High Energy Target***.



Resolution ★★★★★ 0.5 µm
Power ★★★☆☆ 25 Watt
Magnification ★★★★★
Applications CT HR DM

Product line *TCNF* - microfocus tubes with highest resolution and optimal focal spot stability

Product line ***TCNF*** is recommended for computed tomography (CT), metrology (DM), and high resolution (HR) inspection in electronics industry and science.

Internal liquid cooling of tube head for permanent stability of focal spot position, liquid cooling of turbo pump to avoid vibrations.

25 Watt max. target power.

Ultimate JIMA resolution of 0.5 microns (µm) and highest magnification for semiconductor, electronics, and composite applications, featuring the ***High Resolution Diamond Target.***

Innovative Microfocus X-Ray Tubes - Made in Germany

Product Lines

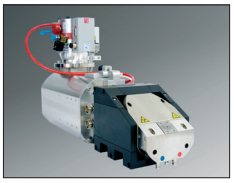
Microfocus Reflection Tubes

Resolution ★★★☆☆ 2.0 µm
Power ★★★★★ 350 Watt
Magnification ★★★★☆
Applications PCT 2D RT CR DR

Product line *SE* - high power microfocus tubes with reflection target

Product line ***SE*** is recommended for planar computed tomography (PCT), two-dimensional (2D) inspection, radiographic testing (RT), computed radiography (CR), and digital radiography (DR) in automotive and aerospace industry.

Ultimate tube power of 350 Watt / 300 kV.



Resolution ★★★☆☆ 2.0 µm
Power ★★★★★ 350 Watt
Magnification ★★★★☆
Applications CT DM IN

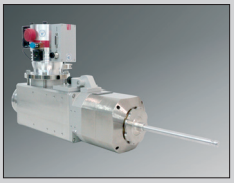
Product line *CT* - microfocus tubes with reflection target optimized for computed tomography (CT)

Product line ***CT*** is recommended for computed tomography (CT), dimensional measurement (DM), and inline inspection (IN) in electronics, automotive industry, and science.

Ultimate tube power of 350 Watt / 300 kV.

Liquid cooling of tube head and turbo pump.

Microfocus Rod Anode Tubes



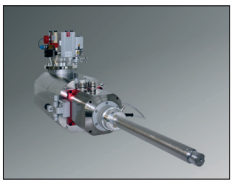
Resolution ★★☆☆☆
Power ★★★☆☆
Magnification ★★★☆☆
Applications RT CR DR

Product line *RA* - microfocus rod anode tubes

Product line ***RA*** is recommended for radiographic testing (RT), computed radiography (CR), and digital radiography (DR) in aerospace and energy industry.

Easy exchange of rod anodes with standard transmission targets.

Small diameters down to 10 mm; directional and transmission targets.



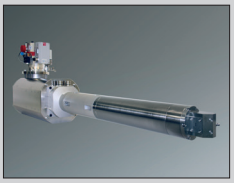
Resolution ★★☆☆☆
Power ★★★★★
Magnification ★★★☆☆
Applications RT CR DR

Product line *RAC* - microfocus rod anode tubes

Product line ***RAC*** is recommended for radiographic testing (RT), computed radiography (CR), and digital radiography (DR) in aerospace, energy, and railway industry.

Internal cooling of target and sealings.

Length up to 100 cm; panoramic and directional targets.



Resolution ★★★☆☆
Power ★★★★★
Magnification ★★★☆☆
Applications RT CR DR

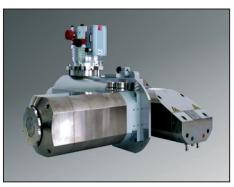
Product line *RAC Superfocus* - rod anode tubes with high resolution, optimized for digital radiography (DR) applications

Product line ***RAC Superfocus*** is recommended for radiographic testing (RT), computed radiography (CR), and digital radiography (DR) in aerospace and energy industry.

Internal cooling of target and sealings; full support of new standard EN ISO 17636-2.

Exchangeable target heads, length up to 150 cm at only 70 mm diameter; panoramic and directional targets.

Microfocus Dual Head Tubes



Resolution ★★★★★ 2.0 ^{R} / 0.9 ^{T}
Power ★★★★★ 350 ^{R} / 10 ^{T}
Magnification ★★★★★
Applications CT HR

Product line *XC* - microfocus tubes with exchangeable tube heads

Product line ***XC*** is recommended for computed tomography (CT) and highest resolution (HR) inspections in science and research.

Exchangeable tube heads with automatic recognition, ultimate tube power of 350 Watt / 240 kV (reflection tube), JIMA resolution 0.9 microns (µm) (transmission tube), paramount flexibility for versatile applications. Different target materials (Cu, Ag, Mo, Cr) available.

Innovative Microfocus X-Ray Tubes - Made in Germany

LEGEND

TECHNICAL PRODUCT DATA SHEETS

Applications for Microfocus X-Ray Tubes

CT	**Microfocus computed tomography (CT)** is a high resolution test procedure to generate two-dimensional cross sectional images of an object. The procedure is used for quality management in all fields of industry. The cooperation of high contrast digital detectors and high resolution X-ray tubes allows very short cycle times to achieve three-dimensional test results of high grade products. At high levels of magnification it is possible to analyze details in the size of a few microns only. This requires highly stable X-ray sources with active management of the heat generated during operation.
PCT	**Planar computed tomography (PCT)** is a special procedure of computed tomography for the high resolution X-ray inspection of large-scale flat components. Planar computed tomography is employed for testing of assembled printed circuit boards (PCBs), semiconductor components in power electronics, or assemblies made of compound materials. It allows examination of selected two-dimensional layers to detect cracks, flaws, and delamination.
DM	**Dimensional measurement (DM)** describes the metrological analysis of distances and dimensions inside a volume data set that was acquired by a microfocus CT scan or microfocus PCT scan. Dimensional measurement is used for first article inspection and quality management in routine testing. It may partly replace coordinate measurement with touch probes or optical sensors. Measurement accuracy may be down to a tenth of the voxel size of the underlying volume data set due to the high number of virtual measuring points. In some cases an accuracy of less than one micron can be achieved.
HR	**Highest resolution (HR) X-ray microscopy** allows the presentation and analysis of minute details in magnitudes of a few microns down to less than 500 nanometers. It requires a magnification of more than 1000x and an X-ray tube with a resolution of less than 1 micron. During long exposure times the X-ray source is stabilized by efficient cooling of tube head and turbo pump.
2D	**Two-dimensional (2D) X-ray testing** allows for the quick and accurate evaluation of hidden details in the magnitude between 10 and 100 microns. It is an excellent procedure for the screening of high quantities so that it provides the fundament for an efficient quality management. With a potential inspection speed of more than one part per second, two-dimensional X-ray inspection is the fastest procedure of X-ray testing with the lowest costs per unit.
IN	**Inline X-ray inspection (IN)** describes the integration of X-ray inspection into the production line. Test parts are automatically inspected and separated into groups of good parts and bad parts. Permanent operation, semi- or fully-automatic loading of the test parts as well as automatic defect recognition (ADR) are essential features of an X-ray system for inline inspection. The X-ray sources in use must be operated with highest stability and accuracy to guarantee a high rate of defect detection.
RT	**Radiographic testing (RT)** is an imaging procedure of non-destructive testing to represent differences in material. The density of a test object is mapped to an X-ray film using an X-ray source. After processingthe X-ray film, differences in material and defects can be identified. Radiographic testing is applied in all areas of industry and specified by numerous codes and standards (e.g. DIN EN ISO 17636-1:2013 on radiographic testing of welds)
CR	**Computed radiography (CR)** with imaging plates is a digital imaging procedure, similar to the classical radiographic testing. Instead of X-ray film, a reusable phosphor imaging plate is used, that is read out by a scanner after exposure. The scanner generates a digital image of the radiographed object. Computed radiography is used in all industries and is specified in numerous standards and codes (e.g. DIN EN 14784-1:2005 and ASTM E 2445:2005 on the classification of systems for industrial computed radiography).
DR	**Digital radiography (DR)** is the most recent imaging procedure of industrial radiography. It applies an electronic detector to capture the radiographic image. Using digital radiography the digital image of a test object is available in real-time and can be evaluated right after the exposure. Digital detectors provide higher dynamics than X-ray film so that exposure times can be decreased. Often the magnification technique is used. Digital radiography of welds is described in the standard DIN EN ISO 17636-2:2013.

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