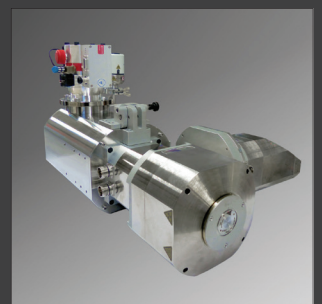
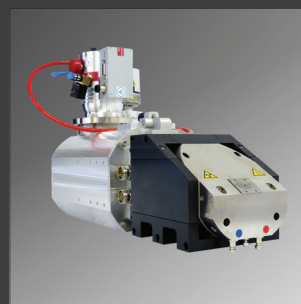
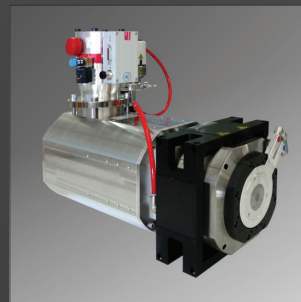
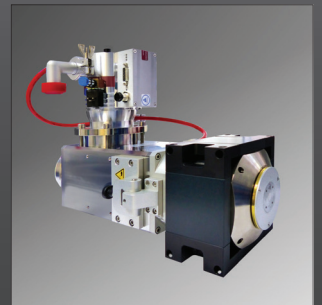




X-RAY
WorX
Superior Microfocus Technology

X-RAY WorX

Microfocus X-ray Sources



INTRODUCTION

Microfocus X-ray sources have been used since more than 35 years in innumerable scientific and industrial applications. Starting as a niche technology for leading edge research, it became a standard in material and life sciences, prototyping, and industrial quality control.

New production methods like additive manufacturing, increasing requirements in quality testing and metrology but also the availability of advanced X-ray detectors and powerful computer systems are pushing the development of highest performance X-ray systems.

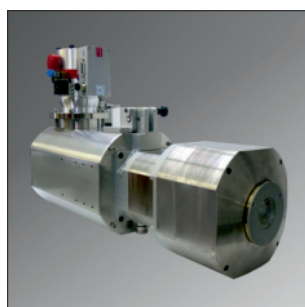
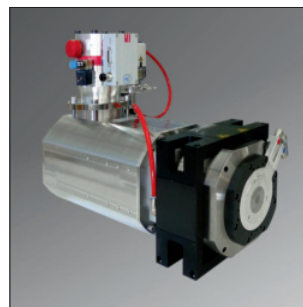
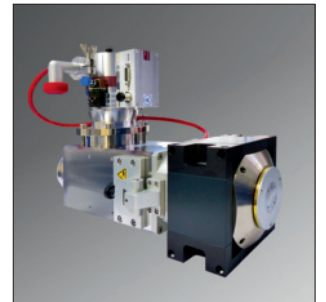
Automated digital radiography, high resolution computed tomography and industrial metrology require specialized X-ray sources. We at X-RAY WorX are listening to our customers carefully and developed a range of X-ray products tailored for particular tasks.

The most important drivers of X-RAY WorX development activities are the reduction of cycle times, the increase of accuracy, the improvement of stability and reliability and the ease of use for both integration and operation.

X-RAY WorX offers X-ray tubes with transmission targets for highest magnification and resolution. The cooling of the transmission target allows target power up to 50 Watt which helps decreasing scanning times in inline testing. Reflection target tubes are designed for higher power up to 350 Watt and support applications with medium magnification and focal spot sizes between 5 and 300 microns. Rod anode tubes help customers increasing their efficiency in weld inspection by switching to panoramic exposure or by replacing film based inspection by digital radiography.

If you are interested in learning more about microfocus technology and products that will provide benefits for your tasks or X-ray machine, please contact one of X-RAY WorX local representatives or X-RAY WorX sales department directly. We will provide you more detailed technical information about our products and may also recommend the most suitable microfocus X-ray source for your application.

X-RAY WorX Product Overview




Product Data Overview

MICROFOCUS X-RAY TUBES - HIGH POWER

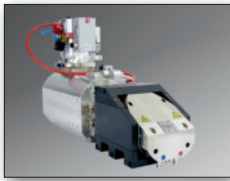
PRODUCT LINES SE, CT, CT PLUS, XC, RAC, RAC SUPERFOCUS


Microfocus High Power X-Ray Tubes



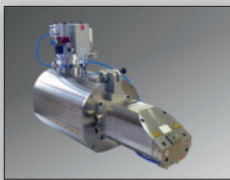
Resolution ★★★★★ 2.0 μm
 Power ★★★★★ 350 Watt
 Magnification ★★★★★
 Applications 


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 and voltage up to 300 kV.



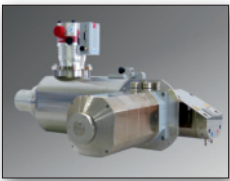
Resolution ★★★★★ 2.0 μm
 Power ★★★★★ 350 Watt
 Magnification ★★★★★
 Applications 


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 and voltage up to 300 kV.
 Liquid cooling of tube head and turbo pump.



Resolution ★★★★★ 4.0 μm
 Power ★★★★★ 500 Watt
 Magnification ★★★★★
 Applications 


Product line CT Plus - microfocus tubes with reflection target optimized for computed tomography (CT)
 Product line CT Plus is recommended for computed tomography (CT), dimensional measurement (DM), and inline inspection (IN) in electronics, automotive industry, and science.
 Paramount tube power 500 Watt also at maximum voltage of 300 kV.
 Internal cooling of the tube head and turbo pump for highest stability of focal spot position increases accuracy of CT scans.



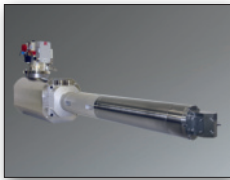
Resolution ★★★★★ 2.0 μm^R
 0.9 μm^T
 Power ★★★★★ 350 W^R
 10 W^T
 Magnification ★★★★★
 Applications 


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.



Resolution ★★★★★
 Power ★★★★★
 Magnification ★★★★★
 Applications 

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 

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.

LEGEND

TECHNICAL PRODUCT DATA SHEETS

Applications for Microfocus X-Ray Tubes



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.



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.



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.



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.



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.



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.



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 processing the 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)



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).



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.

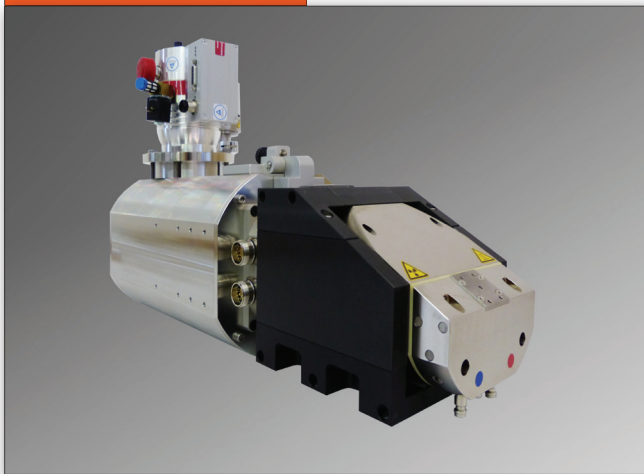
MICROFOCUS X-RAY SOURCES

PRODUCT LINE CT

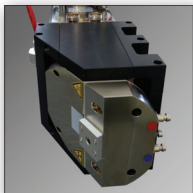


Models incl.: XWT-300-CT, XWT-240-CT, XWT-225-CT, XWT-190-CT, XWT-160-CT

Product image



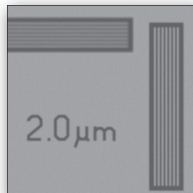
Microfocus X-ray tube XWT-300-CT



XWT-300-CT with filter holder



19" rack for tube controller (optional)



JIMA resolution 2.0 μm : 160kV - 240kV tubes, 3.0 μm : 300kV tubes (in one direction)

Technical data

Data	Product line CT				
Max. voltage (kV)	160	190	225	240	300
Min. voltage (kV)	20	20	20	20	50
Max. current (mA)	3.0	3.0	3.0	3.0	3.0
Min. current (mA)	0.05	0.05	0.05	0.05	0.05
Max. power, emission (Watt)	350	350	350	350	350
Max. power, target (Watt)	300	300	300	300	300
JIMA resolution (μm)*	2.0	2.0	2.0	2.0	3.0
Tube type	Reflection				
Target type	High Power				
Target material	Tungsten				
Min. focus-object-distance (FOD, mm)	4.0	4.0	4.0	4.0	4.0
Opening angle (approx. °)	30	30	30	30	30
Mounting length incl. 90° HV plug (mm)	709	709	779	870	905
Tube weight (approx. kg)	36	36	50	50	69

* in one direction

Highlights

- ▶ Ultimate tube power of 350 Watt / 300 kV
- ▶ Automatic Intensity Control (AIC) for continuous intensity of radiation
- ▶ Automatic tube calibration for optimum performance
- ▶ Cooling of tube head and turbo pump increases accuracy of CT scans
- ▶ Easy maintenance with adjusted ready-to-use click-in cathodes and automatic tube venting
- ▶ Unlimited lifetime

See our new catalogue **Options and Accessories** to find additional auxiliary equipment for your X-RAY WorX tube.

Scope of delivery

- ▶ Open microfocus X-ray tube with reflection target, target cooling, turbo vacuum pump, vacuum gauge, and electronic drive unit
- ▶ Cooling elements for tube head and turbo pump
- ▶ High voltage generator and high voltage cable
- ▶ Prevacuum pump with vacuum hose
- ▶ Two cooling units with hoses and cooling agent
- ▶ Tube controller, power supplies, and safety relays on 19" mounting panels
- ▶ Target aperture with filter holder (including Al, Sn, and Cu filters of different thicknesses)
- ▶ Set of cables for electrical connection of X-ray tube and components

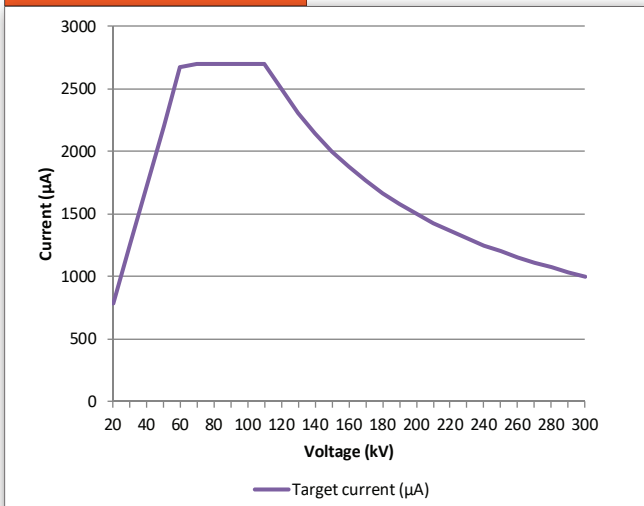
Product Line CT

Focal spot size

		Voltage [kV]						
		60	100	150	190	225	240	300
Target power [W]	50	60	75	60	50	50	50	50
	100	100	120	110	100	100	100	100
	150	150	200	150	150	150	140	140
	200		280	200	200	200	180	180
	250		350	250	250	250	250	250
	300			320	300	300	300	300

Focal spot sizes in microns (μm) based on measurements according to *EN 12543-5*.

Power rating chart



Tube dimensions

