TORONTECH

PORTABLE HIGH FREQUENCY X-RAY GENERATOR (CONSTANT POTENTIAL)

Portable High Frequency X-Ray Generator (Constant Potential) - ToronXCP™ Series

ToronXCP™ Series X-ray generator delivers portable, high-frequency constant potential radiography for nondestructive testing across industrial and field environments. This directional X-ray flaw detection system uses a metal ceramic tube to produce stable, repeatable X-ray output at voltage ranges from 80 kV up to 300 kV. Three models (200GD, 225GD, and 300GD) cover steel penetration thicknesses from 40 mm to 60 mm, making the series suitable for a wide range of weld inspection and material evaluation tasks.

Each unit in the ToronXCP™ Series achieves a 100% duty cycle, which means the X-ray generator operates continuously without mandatory cool-down intervals. This capability reduces inspection time on job sites where throughput matters. The high-frequency inverter technology operates at 100 kHz, producing a smooth, ripple-free X-ray output that improves image contrast and reduces exposure time compared to conventional self-rectified or half-wave generators.

The system consists of two main components: a self-contained generator (tube head) housing the metal ceramic X-ray tube, and a separate control console connected through a low-voltage interconnection cable. This split design keeps the tube head compact and lightweight enough for one or two operators to position in confined spaces, elevated pipe racks, or remote field locations.

APPLICATIONS

Portable High Frequency X-Ray Generator (Constant Potential) - ToronXCP™ Series Applications

The ToronXCP™ Series portable X-ray generator addresses radiographic inspection needs across industries that rely on structural integrity verification and quality assurance programs.

- Pipeline girth weld inspection for oil, gas, and petrochemical transmission lines
- Pressure vessel and boiler fabrication radiography
- Structural steel weld examination in building and bridge construction
- Shipbuilding hull and structural weld verification
- Aerospace component and airframe inspection
- Power generation equipment inspection, including turbine and reactor components
- Casting and forging defect detection in manufacturing facilities
- Corrosion under insulation (CUI) detection in process piping
- Field and shop radiographic testing for general fabrication and maintenance

FEATURES

Portable High Frequency X-Ray Generator (Constant Potential) - ToronXCP™ Series Key Features

The ToronXCP™ Series combines field-ready portability with the performance characteristics demanded by professional radiographic testing operations.

- 100% duty cycle for continuous operation without cool-down intervals, maximizing inspection throughput on job sites
- High-frequency constant potential output at 100 kHz for stable, ripple-free X-ray generation and improved image quality
- Metal ceramic X-ray tube for superior thermal stability and extended service life under demanding operating conditions
- Lightweight, portable tube head design for easy transport and positioning in confined spaces, elevated structures, and remote locations
- Wide operating temperature range from -20°C to +50°C for year-round use in extreme climates
- Voltage adjustment in 1 kV increments and tube current adjustment in 0.1 mA steps for precise exposure parameter control
- Built-in exposure data storage for up to 100 data sets, supporting traceability and record-keeping requirements
- Programmable high-voltage delay adjustment for safe, timed exposure sequences
- Rugged construction rated for harsh industrial and outdoor environments
- Optional Android mobile phone remote control for operator safety during exposures at distance
- Optional GPS satellite positioning for asset tracking and location documentation of inspection sites
- Optional software development kit for system integration into automated inspection platforms

THEORY & METHOD

Theory and Method

The ToronXCP™ Series generates X-rays through the principle of Bremsstrahlung radiation. A heated cathode filament emits electrons, and a high-voltage potential (up to 300 kV depending on the model) accelerates those electrons toward a tungsten anode target inside a metal ceramic vacuum tube. When the electrons strike the target, their kinetic energy converts into X-ray photons and heat. The resulting X-ray beam passes through a beryllium or aluminum window and exits the tube head in a directional cone with a 45-degree beam angle.

Constant potential technology distinguishes this series from conventional pulsed or self-rectified X-ray generators. A high-frequency inverter circuit converts incoming AC power at 100 kHz, then rectifies and smooths the output to maintain a near-constant voltage across the X-ray tube throughout each exposure cycle. This produces a continuous, stable X-ray spectrum with minimal voltage ripple. The practical result is higher average photon energy per exposure, which translates to better penetration efficiency, shorter exposure times, and improved radiographic contrast compared to pulsed systems operating at the same peak voltage.

The metal ceramic tube construction provides superior thermal management compared to glass-envelope designs. Metal and ceramic materials conduct heat more effectively, allowing the tube to sustain continuous operation (100% duty cycle) without overheating. The tube current adjusts from 0.5 mA to 3.0 mA in 0.1 mA increments, giving the operator precise control over X-ray intensity. Operators select the appropriate combination of voltage and current based on material type, thickness, and the sensitivity requirements of the applicable radiographic testing standard.

TECHNICAL SPECIFICATIONS

Portable High Frequency X-Ray Generator (Constant Potential) - ToronXCP™ Series Technical Specifications

The table below presents the complete specifications for all three models in the ToronXCP™ Series. Select the model that matches the required penetration thickness and voltage range for the target application.

Parameter	ToronXCP™ 200	ToronXCP™ 225	ToronXCP™ 300
Output Voltage Range	80 to 200 kV	100 to 225 kV	100 to 300 kV
Voltage Adjustment Step	1 kV/step		
X-Ray Tube Maximum Power	600 W	750 W	900 W

Parameter	ToronXCP™ 200	ToronXCP™ 225	ToronXCP™ 300
Tube Current Range	0.5 to 3.0 mA	0.5 to 3.0 mA	0.5 to 3.0 mA
Tube Current Adjustment Step	0.1 mA/step		
X-Ray Tube Type	Metal Ceramic	Metal Ceramic	Imported Metal Ceramic
Focus Spot Size (EN 12543)	d = 3.0 mm	d = 2.5 mm (1.0 mm optional)	d = 3.0 mm
Beam Angle	45°		
Transmission Sensitivity	< 1.5%		
Max Penetration (A3 Steel, FOD 700 mm)	40 mm	45 mm	60 mm
Duty Cycle	100%	100%	100%
Max Exposure Time Setting	99 min	30 min	99 min
Continuous Exposure Time (at 35°C)	99 min	30 min	99 min
Exposure Data Records	100 sets	100 sets	100 sets
HV Delay Adjustment Range	99 min	59 min	99 min
Operating Frequency	100 kHz		
Voltage	200–250 VAC, 47–400 Hz (110V is also available)	200–250 VAC, 47–400 Hz (110V is also available)	200–250 VAC, 47–400 Hz (110V is also available)
Operating Temperature	-20°C to +50°C	-20°C to +50°C	-20°C to +50°C
Generator (Tube Head) Dimensions	Ø295 × 658 mm (with handles)	Ø295 × 715 mm (with handles)	Ø295 × 800 mm (with handles)
Generator (Tube Head) Weight	20 kg	27.2 kg	29 kg

Parameter	ToronXCP™ 200	ToronXCP™ 225	ToronXCP™ 300
Control Console Dimensions	438 × 158 × 380 mm	350 × 330 × 170 mm	350 × 330 × 170 mm
Control Console Weight	9 kg		
Interconnection Cable Diameter	40 mm	45 mm	60 mm
Power Supply Cable Length	10 m		
Grounding Cable Length	5 m		

Standard Accessories Included:

Each ToronXCP™ unit ships with an alarm lamp, lead letter set, dark bags (5 pcs), intensifying screens (5 pcs), image quality indicator set, fuse set, and center indicator.

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