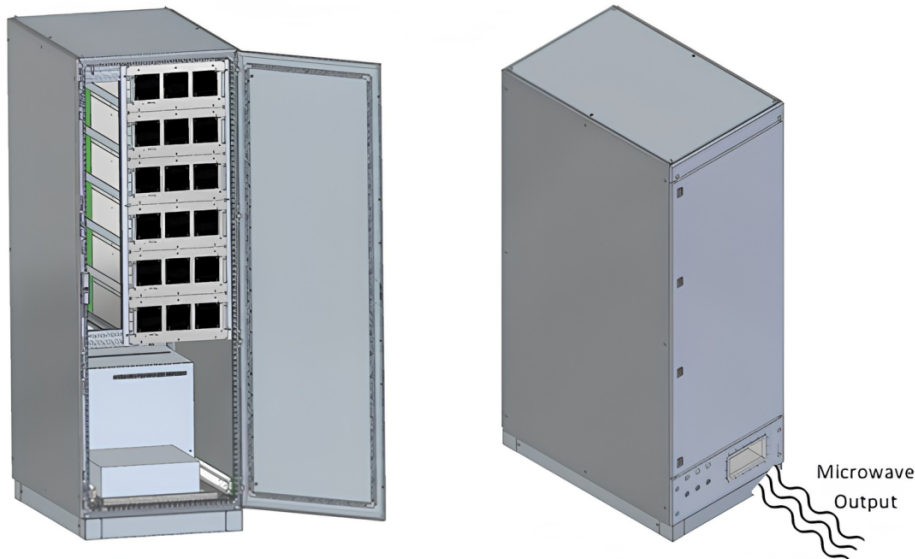


GENERAL INFORMATION of Power Factor Corrected Switched Mode Power Supply



The BPA-PFCW75kW is a water-cooled, modular switched-mode power supply (SMPS) with integrated power factor correction (PFC), specifically engineered for high-power 915 MHz magnetron applications. The system delivers tightly regulated high-voltage DC output with low ripple characteristics, ensuring stable magnetron operation and extended device lifetime.

The active PFC front-end maintains a high input power factor and reduced harmonic distortion across the full operating range, enabling efficient utilization of the AC supply and compliance with industrial power quality standards. The fully modular architecture allows scalable power configuration and inherent fault tolerance. In the event of a module-level failure, the system continues operating with automatic power derating, preserving process continuity and minimizing downtime. Advanced digital control algorithms continuously regulate anode voltage, anode current, filament supply, and electromagnet current to precisely maintain the magnetron operating point, with fast and reliable response to all abnormal conditions. Each 19-inch rack module (5U height) is self-cooled and independently replaceable, ensuring high availability in demanding industrial environments.

FEATURES

- Power Factor Correction up to 0.97 at full load, reduced harmonic distortion, IEEE 519-2014 compliant
- Compliant to EMI standards of: Conducted and Radiated: BS EN/EN55032 (CISPR32) and EN55011 (CISPR11) Class A, Harmonic currents: BS EN/EN61000-3-2, Voltage flicker: BS EN/EN61000-3-3
- Compliant to EMC standards: Voltage Dips: BS EN/EN61000-4-11, Surge EMC immunity: BS EN/EN61000-4-5 level 4, ESD: BS EN/EN61000-4-2 level 3, EFT / Burst: BS EN/EN61000-4-4 level 3
- Very low energy discharge under heavy short-circuit fault of magnetron
- Accurate anode voltage and anode current measurement and closed-loop control
- Anode voltage adjustable from 15 kV to 19 kV based on the magnetron performance curve, optimizing efficiency and lifetime
- Cutting-edge resonant switching topology with low output ripple, less than 1 % voltage, less than 2 % current
- Comprehensive protection suite: over/under temperature, over/under voltage, overcurrent, overload, and short-circuit
- High reliability design compliant with MIL-HDBK-338B and MIL-HDBK-217 standards, minimum continues 1000 hour running
- Fault-tolerant architecture with no single point of failure, seamless automatic load redistribution
- Lower weight and significantly reduced output voltage ripple versus legacy transformer-based generators
- Flexible output power range: adjustable from 7.5 kW to 75 kW in fine increments
- Compatible with multiple magnetron brands and models
- Industrial communication options: PROFINET, CAN, EtherCAT, Modbus TCP, etc.
- All high-quality power electronics and mechanical components sourced from Germany
- Water cooled SMPS

SPECIFICATION ELECTRICAL AND TECHNICAL DATA

Input voltage	380 V _{AC} to 520 V _{AC}
Efficiency	up to 93 %
Input frequency	47 Hz to 63 Hz
Power consumption	95 kVA
Recommended fuse (NH fuse)	200 A
Output voltage adaptivity	15 kV to 19 kV
Anode current variation range	0.5 A to 4.75 A
Absolute Max. output power	75 kW
Output voltage ripple	Less than 1 %
Anode current ripple	Less than 2 %
Active operating temperature	-20 °C to 50 °C
Working humidity	20 % to 90 % RH, non-condensing
Storage temperature, humidity	-30 °C to +70 °C, 10 % to 95 % RH non-condensing
Withstand voltage	30 kV
Dimension	2211 mm × 807 mm × 1207 mm

GENERAL INFORMATION of Magnetron Head

The 75 kW / 915 MHz CW magnetron serves as the microwave generation core, coupling energy via an axial antenna into the waveguide. It is driven by the BPA-PFCW75kW modular SMPS, which regulates anode voltage (15kV to 19 kV) and adaptively controls anode current, filament voltage, and electromagnet field. Acting as the central supervisory controller, the SMPS continuously monitors critical electrical parameters and enforces fast-acting protection against overcurrent and over/under voltage. Its fault-tolerant modular design allows derated operation upon module failure, preserving process continuity without interruption.

To extend magnetron service life, two arc-detection circuits at the waveguide output and isolator trigger immediate power inhibit on fault detection; a high-power isolator dumps reflected power to protect against VSWR transients; mechanical reflected power minimization; and a high-frequency power detector delivers real-time output power data for closed-loop control. Water flow, air flow, and all magnetron electrical parameters are continuously monitored by a PLC fully aligned with the SMPS, ensuring the magnetron head and power supply operate as a single integrated system.

FEATURES

- High-efficiency microwave generation ($\approx 85\%$) at 915 MHz ISM frequency band
- Continuous wave (CW) operation enabling stable and uniform thermal processing
- Fully compatible with modular SMPS architecture for adaptive power control (7.5 kW to 75 kW)
- Direct-heated tungsten cathode ensuring reliable electron emission and long operational life
- Fast and precise power controllability via coordinated adjustment of anode current and magnetic field
- Optimized for closed-loop operation with high-resolution monitoring of anode voltage and current
- Dual arc detection circuits at the waveguide output and isolator for having immediate power inhibit triggered upon fault detection to prevent magnetron damage
- High-power isolator with reflected power dump to shield the magnetron from load-mismatch and VSWR transients
- Dedicated high-frequency power detector for accurate real-time measurement of magnetron output power, feeding directly into the closed-loop control algorithm
- Stable operation under varying load conditions with defined VSWR tolerance
- Dual cooling concept: water-cooled anode and forced-air cathode for effective thermal management
- External electromagnet configuration allowing flexible control of the magnetron operating point
- Industrial-grade reliability suitable for continuous high-power applications
- Comprehensive PLC-based monitoring of all magnetron subsystems including water flow, air flow, and electrical parameters with coordinated interlocks and alarm management
- Full control and monitoring alignment between the magnetron head and the BPA-PFCW75kW SMPS, operating as a single, tightly integrated system
- Cold-swap module replacement in under 15 minutes for rapid field maintenance
- Compatible with fault-tolerant SMPS enabling derated operation under module failure

SPECIFICATION ELECTRICAL AND TECHNICAL DATA

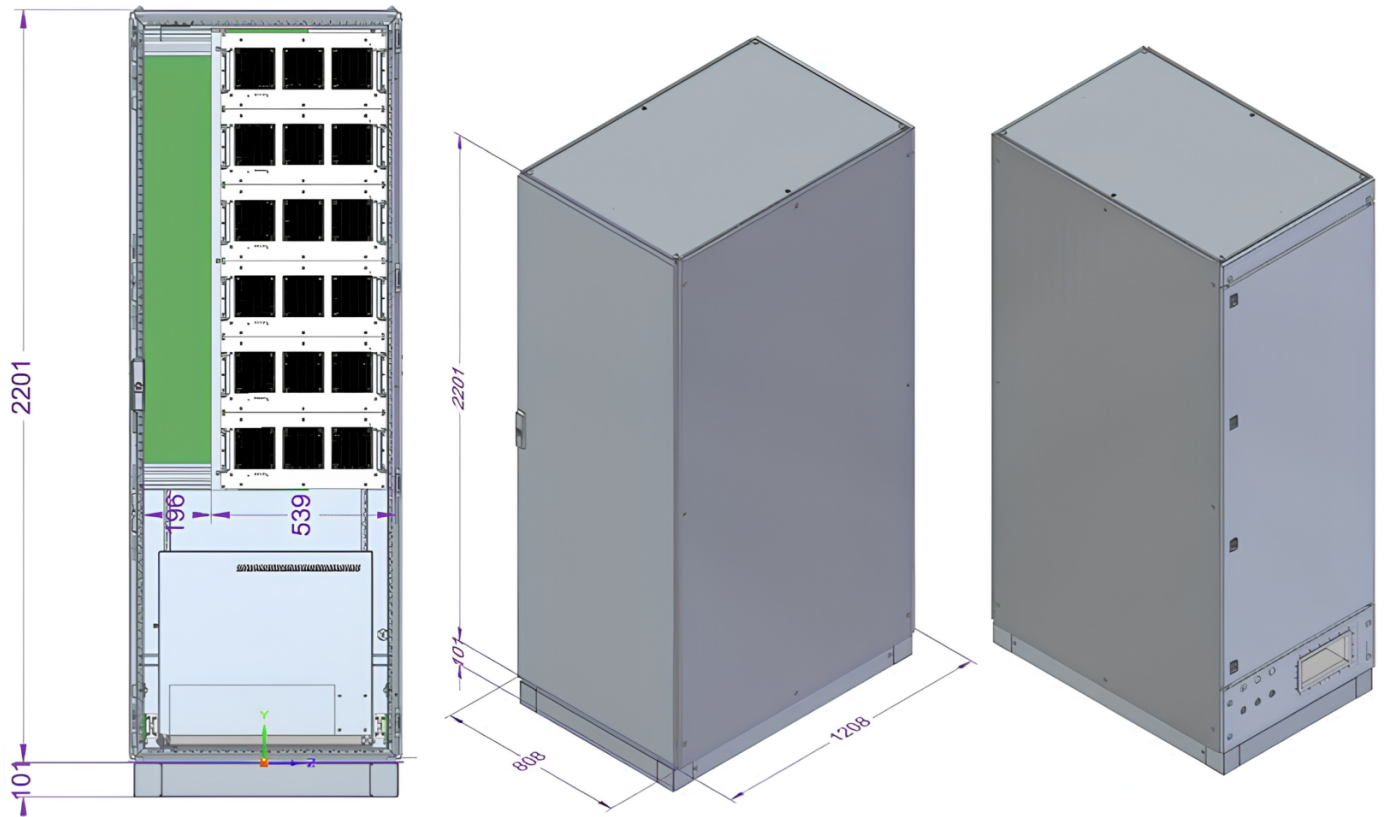
75 kW 915 MHz Magnetron	
Operating Mode	Continuous Wave (CW)
Efficiency	83 % to 88 %
Frequency	896 / 915 / 922 / 929 MHz (± 10 MHz variation)
Nominal Output Power	75 kW
Structure	Metal-ceramic
Anode Voltage (typ.)	18 kV
Anode Voltage (max.)	19 kV
Anode Current (typ.)	4.75 A
Filament Voltage	12.6 V _{AC}
Filament Current (operation)	70 A to 115 A
Load VSWR	1.1: 1 (circulator required)
Cooling – Anode	Water-cooled
Water Flow Rate	≥ 4 gpm (15 L/min)
Cooling – Cathode	Forced air (≥ 5 cfm cathode, ≥ 40 cfm dome)
Electromagnet Cooling	Water-cooled (external electromagnet)
Typical Electromagnet Current	5 A
Total Input water flow	60 L/min
Pressure	5 to 5.5 bar
Flange Type	CPR-975

MAGNETRON GENERATOR

BPA-PFC Water-cooled Series, 75 kW 915 MHz



Dimensions of Generator



Waveguide size: WR-975
Flange type: CPR-975