

TruPlasma MW 1000 Series

Innovative 1000 W water-cooled 2450 MHz MW-SSPG

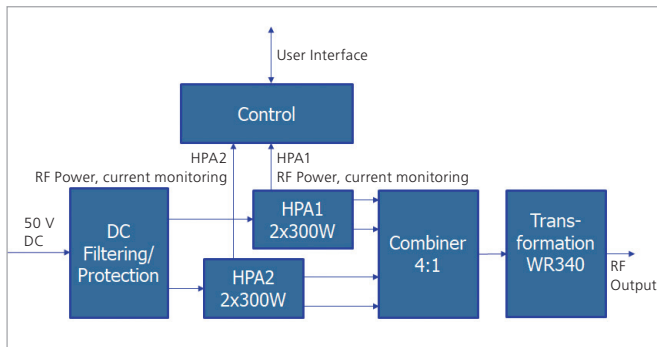
Preface

The demand for robust and accurate Radio Frequency (RF) and Microwave Solid-State Power Generators (MW-SSPG) is increasing, especially with demand for thinner, more accurate, and highly repeatable layer thicknesses in the semiconductor industry. This drive towards thinner films has emphasized the need for precise, repeatably controlled MW-power, from 10 to 1000 Watts, while retaining high reliability.

Technology

The amplifier is based on a robust GaN switch-mode design with internal power compensation. This concept allows a compact water-cooled realization in a small footprint housing in 19" racks. The highly accurate power measurement is carried out via digital sampling techniques and innovative coupling technologies.

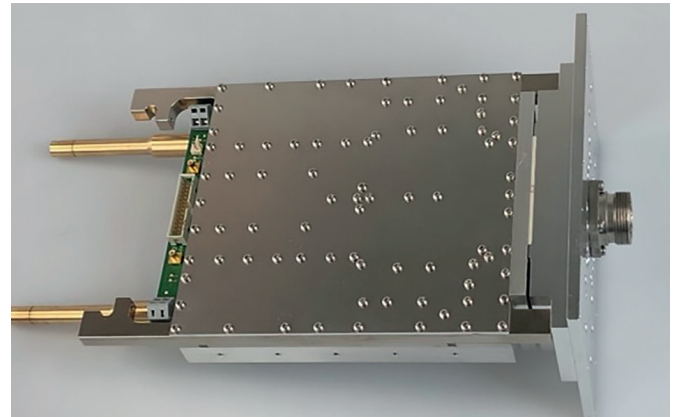
The TruPlasma MW 1000 series provides built-in isolators in combination with a firmware-based automatic protection against mismatching and reflected power.



Block diagram of the TruPlasma MW 1000 series

Efficiency

The generator exhibits a wall-plug efficiency of up to 55 %. This economical advantage results in less energy costs, less overall cooling effort and naturally leads to a faster ROI. It is the perfect product for green energy and your ISO 50001 energy management.



600 W power amplifier

Accuracy

The accuracy for power delivery becomes increasingly important as layer thicknesses become thinner. A calibration method incorporates temperature stabilized measurement components and digital sampling techniques that allow the calibration of the generator with an overall accuracy of $\pm 5.0\%$ into $50\ \Omega$. This accuracy can be ensured for a power range between 100 W and 1000 W.

Interfaces

To allow operation on any tool, the generator may be controlled by:

- EtherNET / TCP / IP Telnet
- EtherCAT
- PROFINET

TRUMPF Huettinger furthermore provides the possibility to control the generator via SCPI commands or a customized web interface that allows operation via a computer.

Features

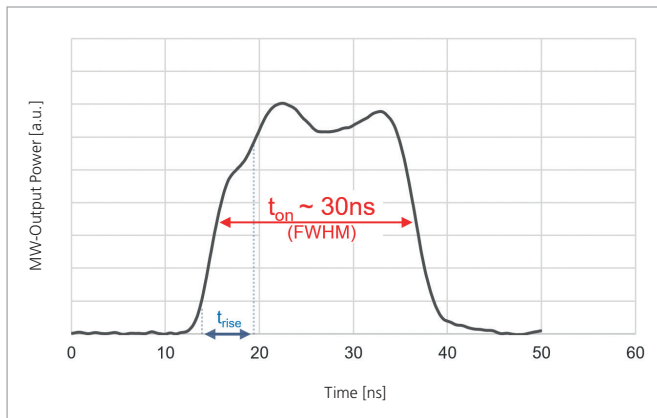
A variety of features are available for this generator. In addition to common features such as frequency agility, this generator series features nano-second pulsing and multi-level pulsing capability.

■ Frequency agility

The generator features a frequency agility of $\pm 2\%$ around the center frequency. This frequency agility provides a fast plasma process optimization during mismatching or ignition conditions.

■ Ultrashort microwave pulsing

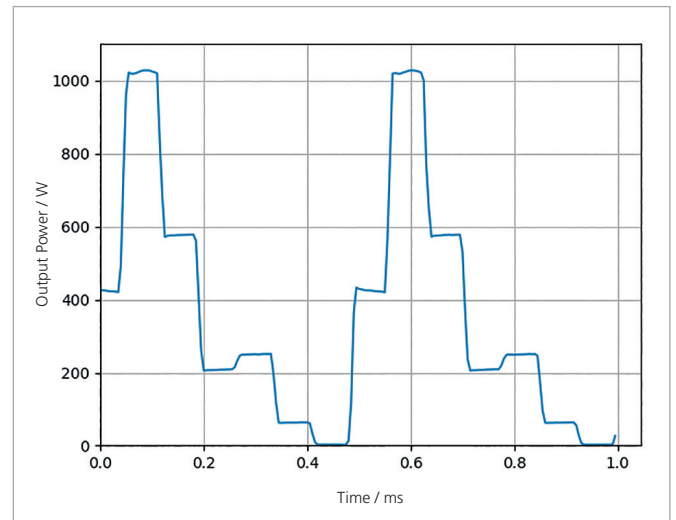
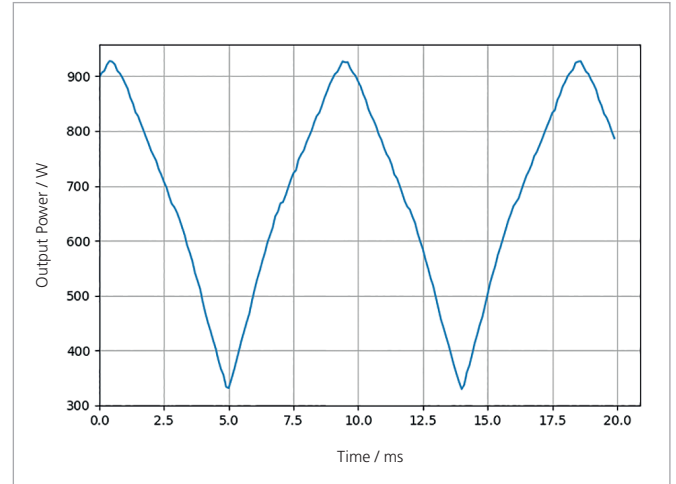
The 2450 MHz TruPlasma MW 1000 series offers ultrashort pulsing down to 30 nsec (FWHM), which enables various applications, such as for instance optimized plasma ignition or well-defined gentle microwave-energy deposition into dielectric objects for heating or non-equilibrium plasma applications.



Ultrashort microwave pulse with on-time $t_{on} = 30$ ns and a pulse rise-time $t_{rise} = 5$ ns

■ Multi-level pulsing

In addition to the standard pulsing feature (1 kHz to 1000 kHz), the generator provides the possibility for multi-level pulsing. Due to an intelligent, fast and digital signal generation, any signal scheme can be generated. This includes ramps and plateaus and provides the possibility for full process customization.



TruPlasma MW 1001: Multi-level pulsing examples

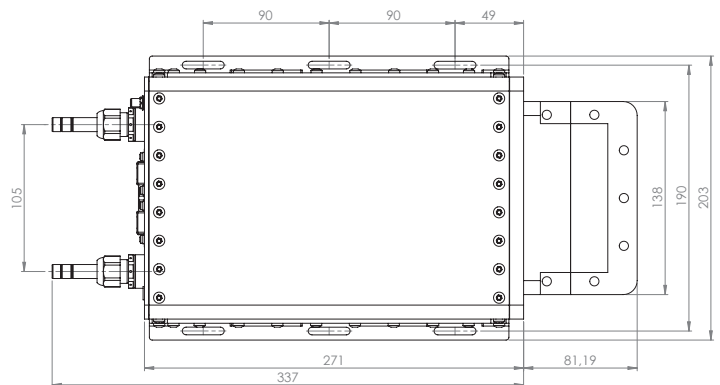
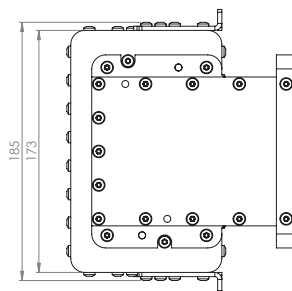
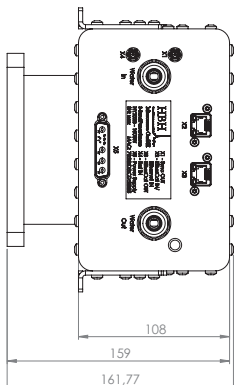
■ Small footprint generator

This TRUMPF Huettinger MW-SSPG generator allows the installation as close to the plasma process as possible. All required measurement components (e.g. voltage and current sensors, impedance measurement) are incorporated and allow the fastest system response possible.



1 kW module with waveguide launcher WR340

MW output	2450 MHz
Full nominal power at 50 Ω	300 W / 500 W / 1000 W
Output power range	10 W – Nominal power
Maximum reflected power	Nominal power
Power accuracy at 50 Ω load	5 % of nominal power
Operating frequency	2450 MHz ± 50 MHz
Nominal output frequency accuracy	1 ppm
Frequency steps	100 kHz
Output impedance	50 Ω
Harmonic signals at full nominal output power at 50 Ω non-reactive load	-40 dBc
MW output	Coaxial cable N-type female connector ¹⁾ 50 Ω or WR340



Operating mode	
Regulation mode	Forward power, Delivered power
Pulse mode	1 kHz to 1000 kHz (upon request)
Pulse duty cycle	3 % – 90 %
Minimum pulse on-time (FWHM)	30 ns
Ripple of output power	5 % RMS
Multi-level pulsing	upon request
Phase control (CEX): Sync MW output to external clock with internal phase shifter	Clock in/out phase shift: 0° to 360° Resolution: ± 1°

Interfaces	
Interfaces	EtherNET, EtherCAT, PROFINET
Sync (reference frequency; pulse; software defined syn)	yes (optional)

Mains	
Wall-plug efficiency at full nominal power at 50 Ω load	up to 55 %
Power supply	external AC DC power supply with 96 % efficiency

Housing	
Dimensions (W x H x D in mm)	419 x 203 x 162 mm (see drawing) or 19" racks
Weight (with flange)	9 kg

Standards and directives	CE, RoHS EN; UL 61010 (NRTL)
--------------------------	---------------------------------

1) Up to 300 W CW

For further information please contact:

HBH Microwave GmbH
a TRUMPF Hüttinger Company
Helmholtzstr. 1
76297 Stutensee, Germany

Phone: +49 7244 60801-0
Fax: +49 7244 60801-89
E-Mail: info.electronics@trumpf.com
Web: www.trumpf-huettinger.com

TRUMPF Hüttinger
generating confidence