

TruPlasma MF Series 7000 (G2)

Optimized
for perfection.



Outstanding layer quality, even with challenging and reactive DMS processes.



TRUMPF Hüttinger
generating confidence

Best in class.

Trust is good, control is better – having both is best of all. With the TruPlasma MF Series 7000 (G2) generators from TRUMPF Hüttinger, you can trust in outstanding layer quality and the highest productivity while simultaneously maintaining full control of your processes.

With their superior arc management and ignition behavior, the output voltage and frequency (adjustable over a wide range) and their high current reserve, our new MF generators are the number one choice for large area coating and demanding processes. As a result of peak efficiencies of more than 90 percent and particularly efficient water management, unique in MF technology, they are also extremely economical to operate.

Choose the best in class – the TruPlasma MF Series 7000 (G2) deserves your trust!



Market leader for large area coating.



Outstanding results with coating processes in the display / touch panel industry.



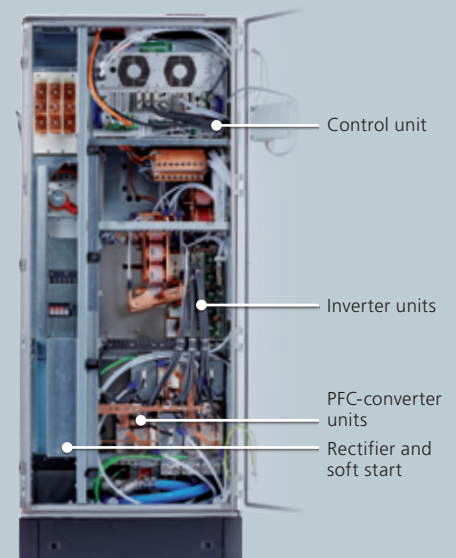
Full control in the production of thin film solar cells.

Highest reliability even with critical processes.

With a TruPlasma MF Series 7000 (G2) generator, you have full control over even the most critical processes – for example, applying challenging materials such as SiO_x to architectural glass, Al_xO_y coating flat screens or the TCO coating of solar glass. TRUMPF Hüttinger's highly developed MF technology makes it possible to apply extremely thin (in the nm range), high-strength and absolutely homogenous layers. In the fields of architectural glass, displays / touch panels or solar – put your trust in the know-how of the technology leader TRUMPF Hüttinger!

Low space requirements, maintenance-friendly concept.

All components of a TruPlasma MF Series 7000 (G2) generator are housed in a compact control cabinet with a very small footprint (800 x 800 mm). This low space requirement is particularly useful in the field of glass coating, since several generators have to be installed side by side as a rule. All generator modules in the control cabinet are easily accessible from the outset and can be replaced quickly and easily by qualified personnel. Calibrating the replacement modules is not required. The mains connection, power cables and control lines can be connected on site, from above or below as an option. The water connection is accessible without having to open the door at the front.





Highlights at a glance

- 1 Superior arc management:
Outstanding layer quality and productivity
- 2 Maximum cost effectiveness over the entire
lifespan, highest wall plug efficiency
- 3 Flexible cooling concept: Stable process power
supply, even under difficult ambient conditions
- 4 Broad operating range: Well suited for application
worldwide without technical adaptations

Additional benefits for your application

- 1 Broad frequency range: Perfect deposition quality
independent of target material
- 2 Effective ignition aid:
Ignition pulse: -2000 V – -3000 V
- 3 Voltage controlled transition mode:
Trouble free operation in transition mode
- 4 Convenient operation:
Easy configuration and in-depth diagnostics

Maximum efficiency.

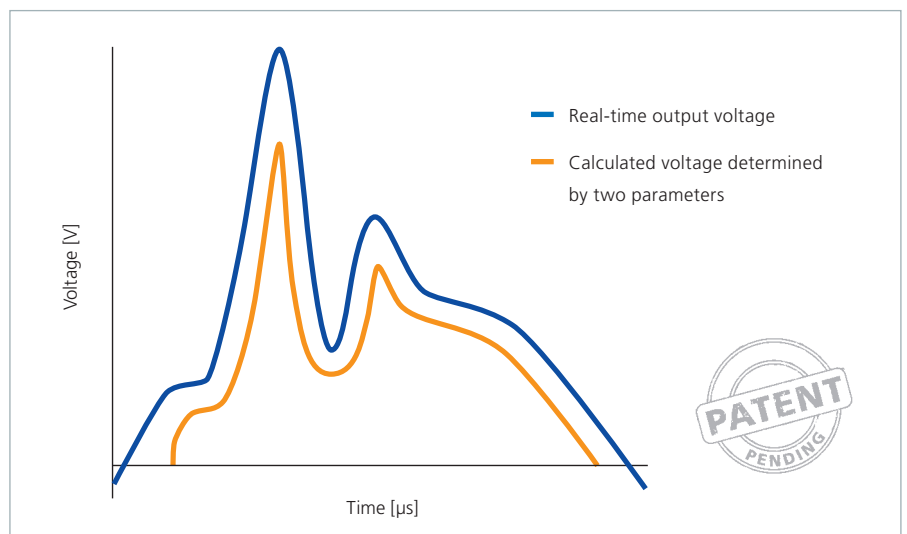
1 Superior arc management.

The key to outstanding layer quality and productivity lies in the superior arc management of the TruPlasma MF Series 7000 (G2). High reaction speeds and corresponding reduced residual energies ensure stable processes and maximum sputtering rates. This results in absolutely homogenous layers across the entire substrate surface.

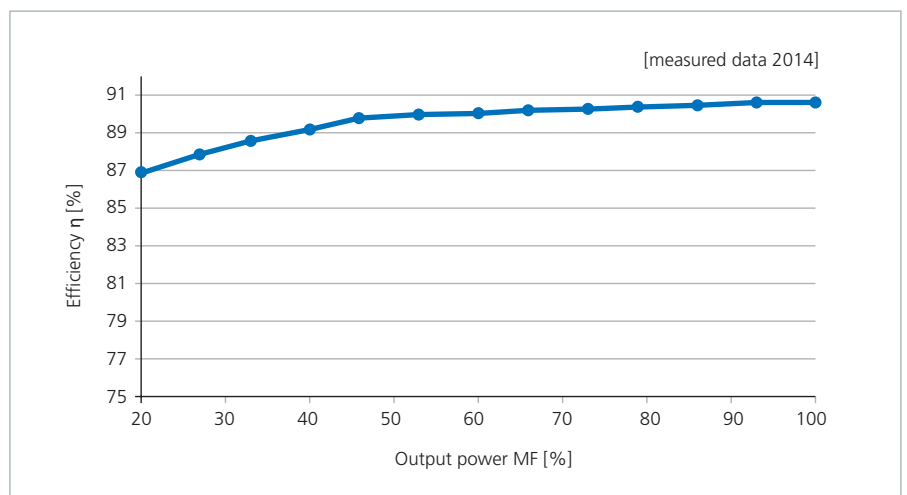
Straightforward adjustment with few parameters supports the flexible adaptation to a wide variety of processes. This makes it easy for you to find the optimum balance between the sensitivity of arc treatment and the desired throughput.

2 High operating efficiency.

The TruPlasma MF Series 7000 (G2) guarantees maximum cost effectiveness over the entire lifespan. With its sophisticated energy concept, the generators feature outstanding operating efficiency with simultaneous minimal energy consumption. Their exemplary reliability and long lifespan also ensure very high system availability and therefore the lowest operating and maintenance costs.



The fastest arc recognition is realized on the basis of just two parameters: The voltage value of each half-wave is compared to the corresponding value of the previous half-wave with the same polarity. This makes real-time arc recognition possible even before the output current rises.



With a peak efficiency of 91 %, an operating efficiency of more than 80 % is realized even during partial load operation of just 10 %.

unique

3 Flexible cooling concept.

The production conditions in different parts of the world differ widely in some cases which makes the robust technical layout of the generators all the more important in order to guarantee a stable process power supply even under challenging ambient conditions. As a result, the TruPlasma MF Series 7000 (G2) generators handle high coolant water temperatures of up to 45 °C and low differential pressures of 2.5 bar without difficulty. The consumption of coolant water can also be adapted to the supply temperatures – a TRUMPF Hüttinger innovation.

High relative humidity in tropical countries does not affect our generators. The thoroughly sealed (IP 54) control cabinet supports operation with dry air purging, preventing the formation of condensate in the unit. Furthermore, the TruPlasma MF Series 7000 (G2) can be equipped with active control cabinet dehumidification.

4 Broad operating voltage range.

The TruPlasma MF Series 7000 (G2) generators are also very flexible in regards to their electrical layout. With a broad connected voltage range of 380 to 480 V \pm 10 %, they can be used worldwide without technical adaptations. As a result, costly conversions of the existing installations on site are not required. This makes an additional contribution to highly economical operation.



One hundred percent water cooling is not only highly effective but a very clean cooling method as well. The risks of air cooling (for example contamination or corrosion due to salty air) are avoided.

Overview of your benefits:

- | | | |
|--|---|--|
| 1 Superior arc management | ▶ | outstanding layer quality and productivity |
| 2 High operating efficiency | ▶ | maximum cost effectiveness over the entire lifespan |
| 3 Flexible cooling concept | ▶ | stable process power supply, even under difficult ambient conditions |
| 4 Broad operating voltage range | ▶ | suitable for application worldwide without technical adaptations |

Innovations with added value.

1 Effective ignition aid.

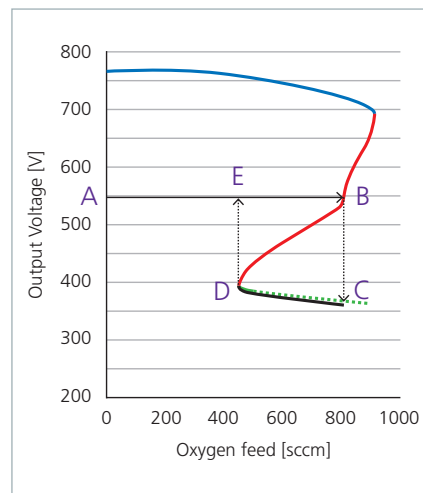
As a rule, the ignition of plasma requires a much higher voltage than maintaining the running process. The ignition aid developed by TRUMPF Hüttinger works with a low energy input, so that arc formation and thermal stress are avoided. Individual control of the ignition process is given by the ignition voltage and ramp time parameters.



Version	Ignition voltage
1100 V standard version	≤ 3100 V (adjustable)
540 V high current version	≤ 1500 V (adjustable)

2 Voltage-controlled transition mode.

The ideal process state for the sputtering process is the so-called transition mode – posing especially high requirements for process control. With corresponding pre-adjustment, the MF output, current and voltage of the generators are determined by the target impedance alone – upward or downward fluctuations during the transition are excluded. The controller also reacts very quickly to changes in the target and process states.



Operating points in voltage-controlled operation.

3 Broad frequency range.

With its broad frequency range from 20 to 70 kHz (optional), which can be adjusted independently of the MF output, current and voltage, the TruPlasma MF Series 7000 (G2) generators are particularly flexible in coordinating the process parameters. This means you can easily find the optimum balance between the desired productivity and layer quality for any process.

4 Convenient operation.



Our easy to use, multilingual TruControl Power software has numerous features for operation, configuration and diagnosis. TruControl as a graphical PC user interface displays all relevant actual values; the nominal values can be specified by you. Intelligent warnings and alarm messages support rapid troubleshooting.

By recording and visualizing important operating parameters with high temporal resolution (oscilloscope function) and summarizing measurements over a long period of time (trend function), you are provided with important information to ensure process quality. Operation and fault analysis are supported without additional hardware.

The convenient TruControl Power operating software features comprehensive configuration and diagnosis functions.

Additional benefits for your application:

- 1 Effective ignition aid ▶ prevents arc formation and thermal stress at the targets
- 2 Voltage-controlled transition mode ▶ trouble-free operation in transition mode
- 3 Broad frequency range ▶ precise control of layer quality and productivity
- 4 Convenient operation ▶ effective configuration and diagnosis

Product
versions.



	TruPlasma MF 7000 (G2)			Competitor		
	100 kW	120 kW	150 kW	100 kW	120 kW	150 kW
Output parameters						
Output power	100 kW	120 kW	150 kW	100 kW	120 kW	150 kW
Output voltage	≤ 1100 V (1500 V boost)			1460 V at highest tap		
Frequency range Standard range Extended range	20 – 50 KHz 20 – 70 KHz		20 – 50 KHz /	47 to 60 kHz typical at full power, up to 100 kHz at minimum power		
Arc handling						
Max. arc rate	8000 1/s			NA		
Arc detection time	0.7 μs			Process data required		
Arc detection	U absolute I absolute Intelligent „I envelope“ Intelligent „U envelope“			Overcurrent detection Impedance detection		
Residual energy	1 mJ/kW			1 mJ/kW		
Arc shutdown time after detection	1.5 – 2 μs for UltraFast			20 – 30 μs		
Arc shutdown	Flexible e.g. 20 μs			100 μs		
Mains input parameters						
Mains voltage	380 – 480 V ±10%			400 or 480 V ±10%, 3 Φ		
Mains frequency	45 to 65 Hz			47 to 63 Hz		
Power factor	> 0.95			≥ 0.95		
Efficiency	Up to 91%			≥ 88% typical	≥ 90% typical	
Current control / accuracy	±0.25% maximum output current + ±1% set value			+0.3% of full rated output current		
Cooling specifications						
Cooling method	Water			Air + Water		
Rate of water flow for the power supply unit @25° C @35° C	≥ 30 l/min ≥ 43 l/min	≥ 31 l/min ≥ 45 l/min	≥ 36 l/min ≥ 59 l/min	42 l/min	53 l/min	
Cooling water temperature	5°C – 35°C or 45°C with power derating			10°C – 40°C		
Interfaces						
MF Control interface	RS232/485, Ethernet, Profibus, A/D, EtherCAT, PROFINET, Ethernet IP, DeviceNet IP, OPC UA IoT interface ²			A/D, Profibus, RS232/485		
Footprint						
Dimensions (w x h x d) in mm	800 x 2000 x 800			1206.5 x 2013 x 768.4	1206.5 x 2133.6 x 768.4	
Opening angle doors	Option of 130° and 180°			130°		
Weight	610 kg	660 kg		~ 907 kg	1180 kg	
Protection class	IP 54			Pollution degree 3		



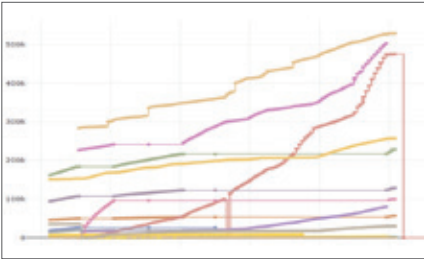
- MF arc switch:
DE102010031568, US20130134890A1, CN103026452A, EP2596517
- MF arc recognition



- MF ignition switch:
DE102010038605, US20130187545A1, CN103038994A, EP2599209



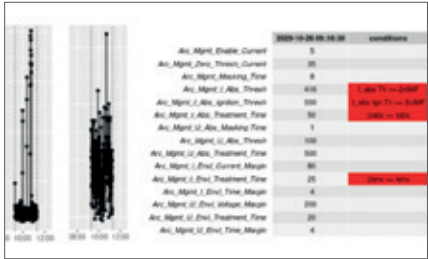
Daily Condition Monitoring



- Analysis of real time data – 24 hours**
- Immediate reaction in case of alarms
 - Reduction of systematic short stops
 - Reduction of time to repair / operation

Uptime / Line speed
Less alarms and warnings

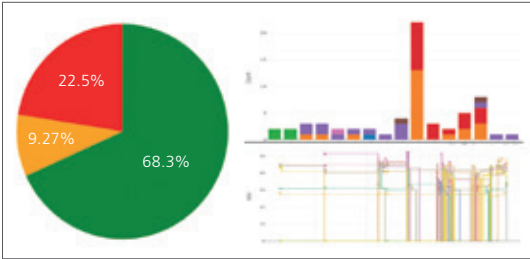
Daily Process analytics



- Analysis of real time data – 24 hours**
- Improve arc management efficiency
 - Reduction of arc rate / arc events
 - Improve power matching

Process yield
Less arcs, defects, nodules

Monthly Performance report



- Monitoring of long-term performance**
- Analysis of major events within report period
 - Summary of past production period
 - Scheduling of preventive services

Performance transparency
Validate best-in-class performance



	All inclusive	All monitored
	IoT Premium Guard	IoT Hotline Guard
Warranty extension (spare parts and labour, excl. travel and lodging)	✓	
Process analytics: proactive, expert, data based remote application support	✓	✓
Quarterly condition and performance report	✓	✓
Remote monitoring of generator operation and data supported service actions (8/5)	in addition: predictive analytics for many subsystems and event triggered service actions (8/5)	✓
Expert, data based remote application support on-demand (8/5)		✓
Managed cloud connectivity	✓	✓
Cloud data storage	✓	✓
Scalable connectivity prepared for 3rd party component access via OPC-UA	✓	✓
24/7 Hotline	✓	✓

