



Plasma &

Reactive Gas  
Solutions

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# LIQUOZON<sup>®</sup> PrimO<sub>3</sub>

## OZONATED WATER DELIVERY SYSTEM WITH OPTIONAL RECIRCULATION

LIQUOZON<sup>®</sup> PrimO<sub>3</sub> Ozonated Water Delivery System is a powerful source for wet wafer processing with ozone, especially in multi chamber single wafer tools. An optional pump at the DIO<sub>3</sub> outlet allows subfloor installation and a pressurized recirculation loop. Moreover, the reclaiming of unused pressureless DIO<sub>3</sub> is possible with the new 'ReClaim' option.

With flow rates of up to 60 L/min and ozone concentrations up to maximum 115 ppm@2 L/min, the LIQUOZON PrimO<sub>3</sub> series is designed for applications such as wet wafer cleaning, contaminant removal, surface conditioning, water mark removal and oxide growth. Several configurations are available to meet special requirements, including an integrated booster pump for low UPW supply pressure and facility connections from top or bottom. As a part of the production proven family of LIQUOZON systems, the LIQUOZON PrimO<sub>3</sub> series is based on the same highly reliable patented SEMOZON<sup>®</sup> ozone generating and dissolving technology.

Ozone is an environmentally friendly alternative to many of the process chemicals used in the semiconductor industry today.

### Features & Benefits

#### Compact Footprint with Excellent Performance and Reliability

- Compact size of only 612 x 612 x 1,805 mm (24.1" x 24.1" x 71.1")
- Maximum 115 ppm dissolved ozone
- Ozonated water flow up to 32 lpm (up to 60 L/min with XF High Flow option)
- Constant ozone concentration and operating pressure at varying flow rates
- Ultra clean for semiconductor processing applications
- Long ozone lifetime in water

#### Faster, Easier Installation, System Integration and Operation

- No analyzer or cabinet drain connection required
- Simple operation via Touch Screen
- Integrated booster pump overcomes low UPW supply pressure and ensures sufficient pressure for multi chamber single wafer tools
- Configured for subfab installation
- Reduced dead volume by optional recirculation
- Accepts internal DIO<sub>3</sub> filter cartridge if needed

#### Clean, Safe Alternative to Conventional Chemical Processing

- High redox potential of ozone
- Ozone generated at point-of-use
- Green chemical easily converted back to oxygen
- Avoids chemical disposal

#### Low Cost of Ownership

- Reduced chemical consumption and disposal costs
- Lower UPW consumption by recirculation or use of idle states during process breaks
- Low oxygen, CDA, cooling water and exhaust consumption
- Supports batch, single wafer or multiple process tools for maximum efficiency
- Small footprint

#### Proven Reliability

- Industry leading ozone generating technology
- MTBF > 20,000 hours



## The LIQUOZON® Family

In addition to the LIQUOZON PrimO<sub>3</sub> system, the well-established family of LIQUOZON ozonated water delivery systems includes LIQUOZON Single, LIQUOZON Smart and LIQUOZON Stream.

The LIQUOZON Single, the most compact member of the LIQUOZON family of ultra-pure ozonated water generators, was specifically designed to supply DIO<sub>3</sub> water to single-wafer cleaning tools, with ozone concentrations between 5 and 95 ppm at flow rates between 0.5 and 20 L/min. The LIQUOZON Smart ozonated water delivery system is a self-contained unit that provides DIO<sub>3</sub> water with exceptionally high, accurate and stable ozone concentration with a performance range from 114 ppm dissolved ozone at 5 L/min to 22 ppm at 80 L/min. With its high flow rates of up to 140 L/min, the LIQUOZON Stream is the strongest system of the family.

The LIQUOZON family features the field-proven SEMOZON ozone generation technology, proprietary MKS designed contactors for unsurpassed dissolving efficiency of ozone gas in water, state-of-the-art controls and an ozone destruct unit for safe reconversion of surplus ozone gas to oxygen. The LIQUOZON systems are enclosed in a vented cabinet and are S2 and CE compliant.

## LIQUOZON® PrimO<sub>3</sub> System

The LIQUOZON PrimO<sub>3</sub> system delivers ozonated ultra pure water (DIO<sub>3</sub>) at a pressure of up to 3.7 bar<sub>g</sub> (0.37 MPa<sub>g</sub>) and at flow rates of up to 32 L/min, (60 L/min with XF High Flow Option). The integrated analyzer for dissolved ozone is used for accurate closed loop control of the DIO<sub>3</sub> concentration. The XF mixing function not only increases the flow rate, but improves the concentration control accuracy and gives the advantage of very fast setpoint changes.

An internal, single-channel ozone gas monitor, which shuts down the LIQUOZON PrimO<sub>3</sub> should an ozone leak occur, is available as an option. The optional UPW inlet booster pump allows operation with low UPW facility supply pressure, for systems without ReClaim function.

In order to reduce the environmental impact and to lower the cost of ownership, the system supports two different types of recirculation concepts:

The recirculation of pressurized DIO<sub>3</sub> through a loop with automatic controlled return flow to the LIQUOZON and, with the ReClaim option, the pressureless DIO<sub>3</sub> return flow to the LIQUOZON of up to 40 L/min, controlled by the TOOL. Thereby, a UPW pump is not required.

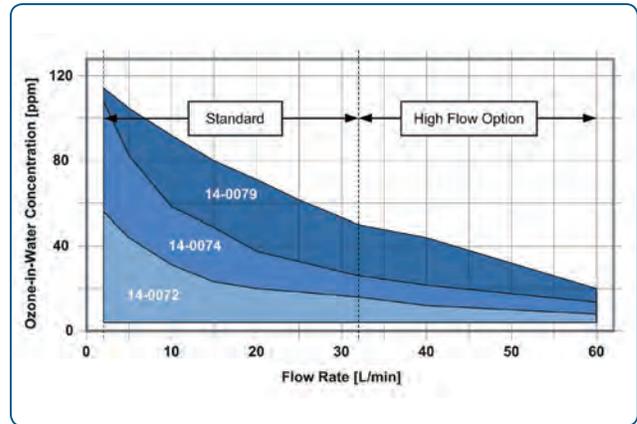
The ReClaim unifies the advantages of the XF mixing function with the potential UPW savings of a recirculation concept.

## Performance

### Concentration and Flow

The regular DiO<sub>3</sub> flow rate and the type of ozone gas generator define mainly the DiO<sub>3</sub> concentration range (see diagram). The specifications refer to a UPW temperature of 20°C at a system pressure of 1.8 - 2.5 bar<sub>g</sub>. At higher UPW temperature or at lower system pressure the maximum performance will decrease.

The LIQUOZON PrimO<sub>3</sub> is designed to deliver a constant ozone-in-water concentration under stable controlled pressure even for varying DIO<sub>3</sub> demands.



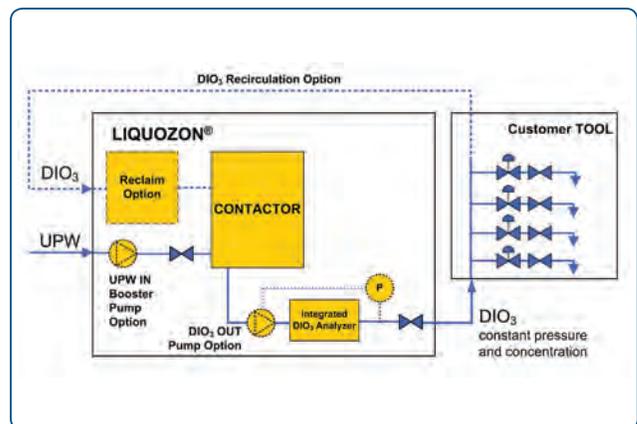
Concentration and Flow Diagram

## Ozone Generation

LIQUOZON PrimO<sub>3</sub> incorporates an ozone gas generator with (depending on the performance requirement) 2, 4 or 10 ozone cells based on MKS SEMOZON AX technology.

SEMOZON AX generators produce ozone from oxygen by dielectric barrier discharge. A small amount of high-purity carbon dioxide (CO<sub>2</sub>) is used as a dopant gas. The CO<sub>2</sub> considerably increases the lifetime of ozone in the UPW. With CO<sub>2</sub> there is no possibility of formation of NO<sub>x</sub> compounds and resultant metal contamination. Highly efficient transfer of O<sub>3</sub> gas into the UPW is accomplished by special MKS designed ozone contactors. The surplus O<sub>3</sub> gas is converted back to O<sub>2</sub> in the integrated ozone gas destruct unit.

High-quality, ozone resistant materials and the unique doping technique ensure ultra-clean ozonated water delivery for high-purity semiconductor and flat panel applications.



## System Flow and Configuration Diagram —

Typical example of a LIQUOZON PrimO<sub>3</sub> application for multiple points of use

# Specifications

## System Specifications

<b>Ozonated Water Pressure</b>	
Without DIO <sub>3</sub> Out Pump	Adjustable range 1.0 to 3.0 bar <sub>g</sub> (depends on UPW supply pressure)
With DIO <sub>3</sub> Out Pump	Adjustable range 1.4 to 3.7 bar <sub>g</sub> (depends on UPW supply and system pressure)
<b>Plumbing Materials</b>	
Liquid Wetted Surfaces	PFA, PTFE, quartz glass
Gas Wetted Surfaces	316L stainless steel, PFA, PTFE
<b>Communication</b>	Binary in/out (dry contacts), RS232, analog out
<b>Compliance</b>	CE, SEMI S2-0302, SEMI F47
<b>Cabinet, Dimensions (W x H x D)</b>	Coated steel, approx 612 mm x 612 mm x 1,805 mm (24.1" x 24.1" x 71.1") (Systems with ReClaim option or roof / bottom facility connections: 612 mm x 908 mm x 1,805 mm (24.1" x 35.7" x 71.1") Overall height including exhaust duct and adjustable feet: Approx. 2200 mm (87")
<b>Weight</b>	Approx. 254 kg - 425 kg, depending on type

## Facility Requirements

<b>Feed Gas O<sub>2</sub></b>	
Purity	≥ Grade 4 (purity ≥ 99.99 %), dew point < -40°C
Inlet Pressure	4.5 - 7.6 bar <sub>g</sub> (0.45 - 0.76 MPa <sub>g</sub> , 65 - 110 psi <sub>g</sub> )
Flow Rate	typ. 5 - 9 slm
<b>Dopant Gas CO<sub>2</sub></b>	
Purity	≥ Grade 4.5 (purity ≥ 99.995 %) or better
Inlet Pressure	5.0 - 7.6 bar <sub>g</sub> (0.50 - 0.76 MPa <sub>g</sub> , 73 - 110 psi <sub>g</sub> )
Flow Rate	typ. 0.15 - 0.2 slm
<b>Ultra Pure Water UPW</b>	
Half Life Time of O <sub>3</sub> in UPW	> 12 min @ 20°C
UPW IN Pressure (full flow)	1 - 5 bar <sub>g</sub> (0.1 - 0.5 MPa <sub>g</sub> , 14.5 - 73 psi <sub>g</sub> ) at least 0.8 bar higher than system pressure; Various pump options have divergent pressure requirements.
Temperature	15 - 25°C (59 - 77°F), rated 20°C (68°F)
<b>Cooling Water</b>	
Quality	Demineralized, filtration ≤ 20 μm
Temperature	17 - 23°C (63 - 73°F), rated 20°C (68°F)
Pressure	max. 5.0 bar <sub>g</sub> (0.50 MPa <sub>g</sub> , 73 psi <sub>g</sub> ) differential pressure > 2 - 3 bar (depending on type)
Flow Rate	typ. 3.0 - 7.0 L/min (0.8 - 1.8 gpm)
<b>Power</b>	3/PE~, 200 - 208 V ± 10 %, 50/60 Hz, 850 - 5750 W

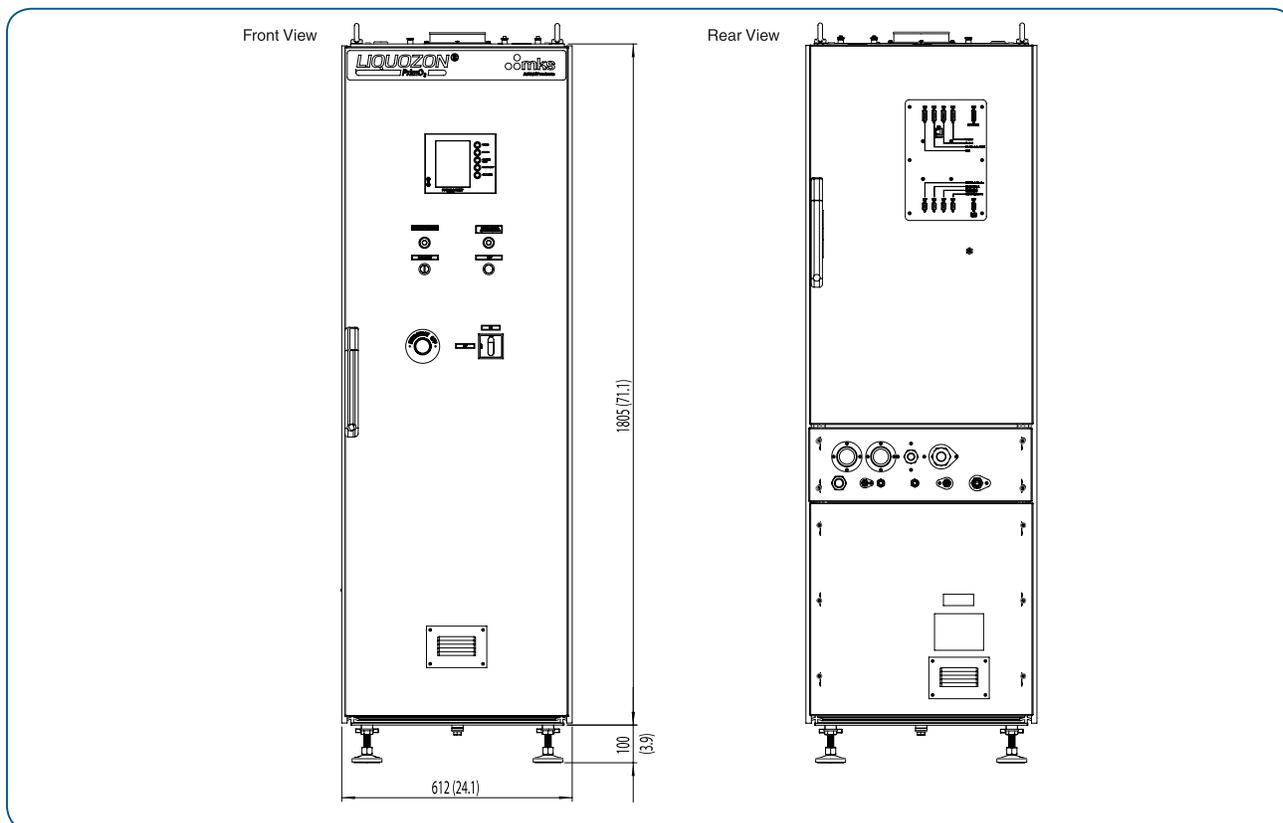
## Performance Summary

### Dissolved Ozone Concentration in UP Water for a given DIO<sub>3</sub> Flow (ppm = mg/L)

DIO <sub>3</sub> Flow System Pressure = 1.8 - 2.5 bar <sub>g</sub> , Water T <sub>nom.</sub> = 20 °C	PN: 14-0072	PN: 14-0074	PN: 14-0079
2 L/min	58 ppm	106 ppm	115 ppm
5 L/min	43 ppm	82 ppm	105 ppm
10 L/min	31 ppm	58 ppm	92 ppm
15 L/min	24 ppm	50 ppm	80 ppm
20 L/min	20 ppm	39 ppm	72 ppm
25 L/min	18 ppm	34 ppm	62 ppm
32 L/min	15 ppm	28 ppm	50 ppm
40 L/min (with XF High Flow Option)	12 ppm	22 ppm	45 ppm
60 L/min (with XF High Flow Option)	8 ppm	15 ppm	30 ppm

## Ordering Information

Please contact your local MKS Sales Office for price and availability information.



### Dimensional Drawing —

Note: Unless otherwise specified, dimensions are nominal values in millimeters (inches referenced). Dimensions differ for systems with ReClaim option or roof / bottom facility connections.



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