



Plasma &

Reactive Gas Solutions

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LIQUOZON[®] Smart

LOWER CoO OZONATED WATER DELIVERY SYSTEMS

As a part of the LIQUOZON[®] family, the Smart series provides the highest flexibility covering a large range of performance and connectivity. The unique option with multiple outlets allows a considerable reduction of the cost of ownership by providing manifold points-of-use with different concentrations.

Features & Benefits

Process Performance, High Repeatability, Flexibility, Ease of Installation and Service

- Wide operating range with unsurpassed ozone control for process consistency and repeatability
 - Up to 114 ppm dissolved ozone
 - Ozonated water flow up to 80 lpm
 - Fast response to adjustments in flow and concentration
 - 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 observation via Touch Screen
- Easy serviceability and troubleshooting
- Highly flexible design for best suitability to specific needs and highest cost-effectiveness
 - Different generator performance options for flow and concentration
 - Optional multi-tool capability with multiple chemical outlets

Clean, Safe Alternative to Conventional Chemical Processing

- High redox potential
- Generated at point-of-use
- Green chemical - easily converted back to oxygen

Low Cost of Ownership

- Reduced chemical consumption and disposal costs
- Lower UP water consumption
- Lower O₂, CDA, cooling water and exhaust consumption
- Supports single or multiple process tools for maximum efficiency and minimum footprint
- Small footprint

Proven Reliability

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



Ozone is an environmentally friendly alternative to many process chemicals in the semiconductor industry. It has a high redox potential, can be generated at the point of use and is easily converted back to oxygen. Cost of purchase, storage and disposal of many chemicals can thus be reduced considerably. LIQUOZON Smart, with the ability to produce a specified ozone concentration up to 114 ppm, was especially designed for wet wafer cleaning, contaminant removal, surface conditioning and oxide growth.

The LIQUOZON® Family

In addition to the Smart series, the LIQUOZON family of ozonated water delivery systems includes the LIQUOZON Single, LIQUOZON PrimO₃ and LIQUOZON Stream.

The LIQUOZON Single, the most compact member of the MKS LIQUOZON family of ultra-pure ozonated water generators, was specifically designed to supply DIO₃ 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 PrimO₃ ozonated water delivery system is a self-contained unit that provides DIO₃ water with exceptionally high, accurate and stable ozone concentration with a performance range from 115 ppm dissolved ozone at 2 L/min to 30 ppm at 60 L/min. An optional pump at the DIO₃ outlet allows subfloor installation and a pressurized recirculation loop. 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 re-conversion of residual ozone gas to oxygen. The LIQUOZON systems are enclosed in a vented rack and are S2 and CE compliant. Closed loop control ensures delivery of ozonated water at a stable ozone concentration, even at variable flow rates.

LIQUOZON® Smart System

The LIQUOZON Smart ozonated water delivery system is a self-contained unit that provides DIO₃ water (ultra pure ozonated water) with exceptionally high, accurate and stable ozone concentration at constant pressure. The basic LIQUOZON Smart with one outlet allows flows up to 25 liters per minute, while the High Flow Mode (XF Mode) option extends it up to 50 L/min. Systems with 2 or 3 outlets with the High Flow Mode (XF Mode) can be operated at up to 80 lpm summarized flow.

The Smart system platform offers a number of further configuration options to meet customer specific needs in the most cost-effective manner:

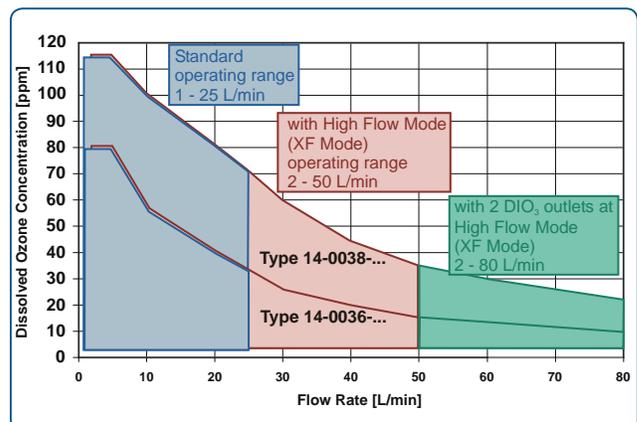
- Choice of different ozone gas generators (performance ranges)
- Multi-tool capability: up to three outlets with individual flow and concentration
- Choice between constant closed-loop controlled DIO₃ supply pressure (recommended) or DIO₃ flow rate
- Optional internal ozone leak monitor
- Optional bypass drain outlet to ensure continuous water flow
- EU RoHS compliant version available

The integrated ozone gas generators are from the highly reliable SEMOZON® AX8400 range, which produce ozone from oxygen by silent electric discharge. A minute amount of carbon dioxide (CO₂) is used as a dopant gas to ensure best ozone generation performance. The CO₂ also considerably increases the lifetime of ozone in the DI water and is ultra-clean. With CO₂ there is no possibility of formation of NO_x compounds or resultant metal contamination. High-quality, ozone resistant materials and the unique doping technique ensure ultra-clean ozonated water delivery for high purity semiconductor and flat panel applications.

Performance

Concentration and Flow

Ozonated ultra pure water (DIO₃) is generated at a pressure of up to 2.5 bar_{gauge} and a flow rate of up to 50 L/min (or even 80 L/min with multiple outlets). At 5 L/min flow, a dissolved ozone concentration of 114 ppm can be achieved. At 50 L/min flow, concentration is a maximum of 36 ppm. LIQUOZON Smart can also be operated at a system pressure below 2.5 bar_{gauge}, but the achievable maximum concentration will be reduced to some degree (see Specifications table).



Specified LIQUOZON® Smart System Performance

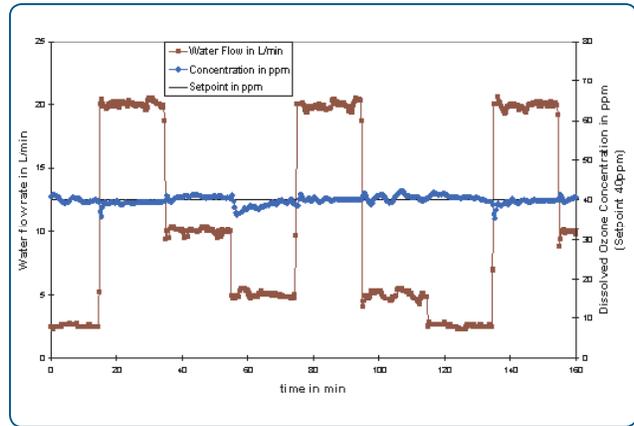


System Design and Configuration

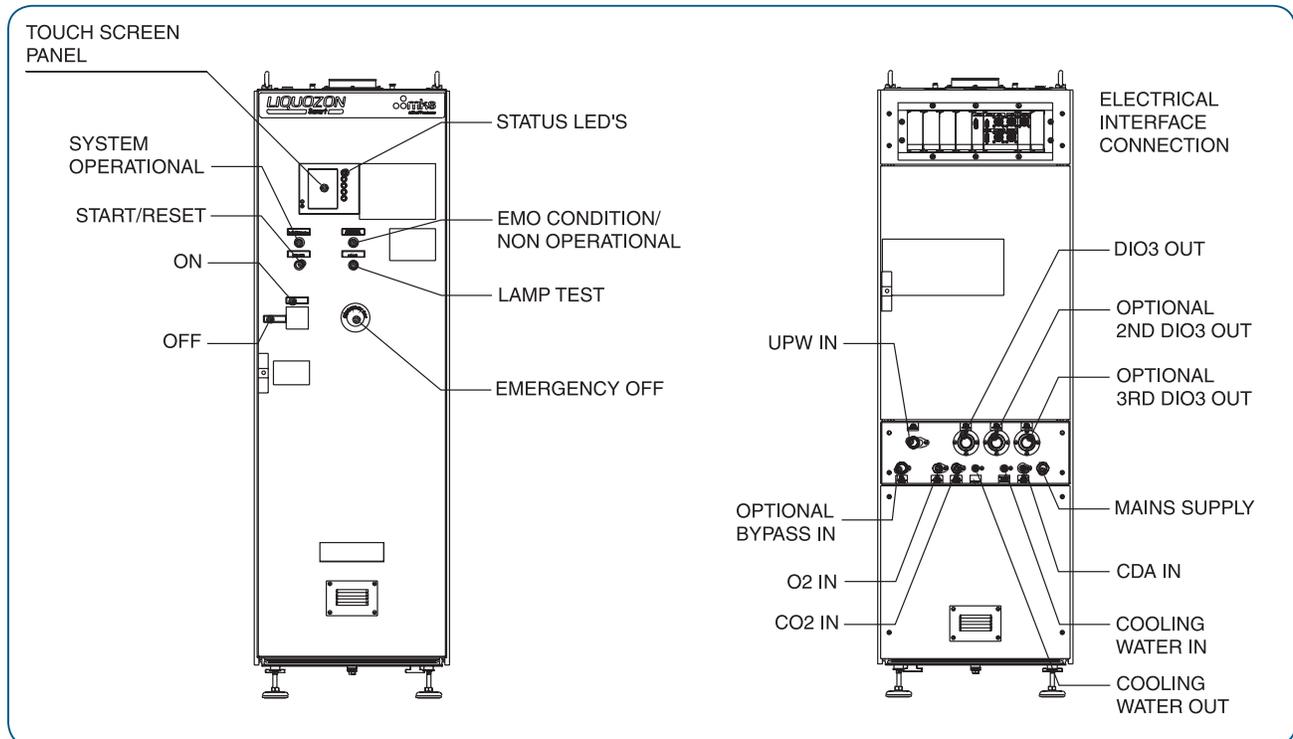
The integrated SEMOZON ozone gas generator converts oxygen (O₂) partially into ozone (O₃). In the special MKS designed contactor, O₃ dissolves in ultra pure water at high efficiency. Residual undissolved O₃ gas converts safely back to oxygen in the integrated ozone destruct unit. An O₃ analyzer continuously measures the O₃ concentration in water and a control loop adjusts the power of the SEMOZON generator to ensure an accurate DIO₃ output concentration.

System Response and Accuracy

LIQUOZON systems provide ozonated water at an exceptionally accurate and stable concentration. While the basic LIQUOZON Smart configuration is designed for applications that operate at a fixed flow rate (up to 25 L/min) and at a fixed concentration set point, systems with the High Flow Mode (XF Mode) extends the flow up to 50 L/min and are also able to respond exceedingly fast to changes of flow rate and concentration set point. At flow rate changes, the High Flow Mode (XF Mode) allows to keep the concentration stable without deviation from the set point and as concentration set point changes, it can mostly achieve this new set point within clearly less than one minute.



LIQUOZON Smart: O₃ concentration stability at changing flow rates



LIQUOZON® Smart — Front and Rear View



Specifications and Ordering Information

| System Type Performance | | 14-0036- | | 14-0038- | |
|--|---|---------------------------------------|--|---------------------------------------|---------------------------------------|
| Specified Maximum Dissolved Ozone Concentration at 20°C (68°F) | | | | | |
| System Pressure | @ DIO ₃ Flow Rate of | 1.0 bar _{gauge} (15 psig) | 2.5 bar _{gauge} (36 psig) | 1.0 bar _{gauge} (15 psig) | 2.5 bar _{gauge} (36 psig) |
| Standard Systems without High Flow Mode (XF Mode) | at 5 L/min | 46 ppm | 80 ppm | 72 ppm | 114 ppm |
| | at 10 L/min | 31 ppm | 55 ppm | 63 ppm | 100 ppm |
| | at 20 L/min | 22 ppm | 40 ppm | 55 ppm | 82 ppm |
| | at 25 L/min | 18 ppm | 33 ppm | 44 ppm | 72 ppm |
| Systems with at least one outlet with High Flow Mode (XF Mode) | at 30 L/min | 15 ppm | 26 ppm | 36 ppm | 60 ppm |
| | at 40 L/min | 11 ppm | 20 ppm | 28 ppm | 45 ppm |
| | at 50 L/min | 9 ppm | 16 ppm | 22 ppm | 36 ppm |
| Systems with at least two outlets with High Flow Mode (XF Mode) | at 60 L/min | 7 ppm | 12 ppm | 18 ppm | 30 ppm |
| | at 80 L/min | 5 ppm | 10 ppm | 14 ppm | 22 ppm |
| Operating Range | 1 – 25 L/min | | | | |
| Flow Basic Version without High Flow (XF mode) | | | | | |
| Flow with option for High Flow Mode (XF mode) | 2 – 50 L/min (up to 80 L/min with multiple outlets) | | | | |
| Operating Pressure | Constant set point configurable from 1.0 to 2.5 bar _{gauge} (15-36 psig), closed-loop controlled, nominal pressure: 2.5 bar _{gauge} (36 psig) | | | | |
| Facility Requirements | | | | | |
| Ambient Temperature | 15 - 35°C (59 - 95°F) | | | | |
| Feed Gas O₂ | | | | | |
| Quality | Grade 4 (purity > 99.99%) or better | | | | |
| Inlet Pressure | 4.5 - 7.6 bar _{gauge} (65 - 110 psig) | | | | |
| Flow Rate | 4 - 8 slm (typically 5 slm) | | 6 - 18 slm (typically 12 slm) | | |
| Dopant Gas CO₂ | | | | | |
| Quality | Carbon Dioxide, Grade 4.5 (purity > 99.995%) or better | | | | |
| Inlet Pressure | 5.0 - 7.6 bar _{gauge} (73 - 110 psig) | | | | |
| Flow Rate | 0.1 - 0.3 (typically 0.2 slm) | | | | |
| Ultra Pure Water UPW | | | | | |
| Pressure | 2.3 - 5.0 bar _{gauge} (33 - 73 psig), min. 0.8 bar (12 psi) above system operating pressure | | | | |
| Quality | Resistivity > 18 MΩ cm | | | | |
| Purity | Purity according to process demands | | | | |
| Temperature | 15 - 25°C (rated at 20°C) | | | | |
| Cooling Water | | | | | |
| Quality | Demineralized (Resistivity > 50 kΩ cm), 20 µm filtered | | | | |
| Recommended Flow | > 3.8 L/min (1 gpm), typically 4.5 L/min (1.2 gpm) | | > 5.68 L/min (1.5 gpm), typically 6.44 L/min (1.7 gpm) | | |
| Temperature | 17 - 23°C (63 - 73°F), rated 20°C (68°F) | | | | |
| Pressure | 2.0 - 5.0 bar _{gauge} (29 - 73 psig) | | | | |
| Power | 3/PE -, 200-208 VAC ±10%, 50/60 Hz, 6.4A(max) | | 3/PE -, 200-203 VAC ±10%, 50/60 Hz, 14A(max) | | |
| Compliance | CE, SEMI S2-0302, SEMI F47, SEMI S2, UL 61010-1 | | | | |
| Control Interfaces | RS232, discrete communication | | | | |
| Physical Data | | | | | |
| Weight | approx. 300 kg (661 lbs) | | | | |
| Dimensions | 600 x 600 x 1900 mm (24 x 24 x 75 in) | | | | |

Ordering Information

Contact your local MKS Sales Office for price and availability information.



MKS Instruments, Inc. Global Headquarters

2 Tech Drive, Suite 201
Andover, MA 01810
Tel: 978.645.5500
Tel: 800.227.8766 (in USA)
Web: www.mksinst.com

MKS Instruments, Inc. Plasma & Reactive Gas Solutions

90 Industrial Way
Wilmington, MA 01887
Tel: 978.284.4000

MKS Instruments Deutschland GmbH Plasma & Reactive Gas Solutions

Wattstr. 11-13
13355 Berlin, Germany
Tel: +49.30.464.0030