

# LIQUOZON® VariO<sub>3</sub> for FPD Applications

Dissolved Ozone Delivery System for FPD Applications



MKS' LIQUOZON® VariO<sub>3</sub> dissolved ozone gas delivery system improves the surface cleanliness and product yield of various process steps in Organic Light Emitting Diode (OLED) and Flat Panel Display (FPD) manufacturing. Carbon and metallic contamination of low-temperature polycrystalline silicon (LTPS) surfaces are effectively removed with MKS' VariO<sub>3</sub> system using a substrate rinsing method that can prevent up to 80% of total yield loss due to contaminated surfaces prior to excimer laser annealing (ELA).

The VariO<sub>3</sub> system provides user controllable and configurable dissolved ozone concentrations at high flow rates and pressure and is available with 1-4 dissolved ozone outlets. Equipped with a green idle mode, the

system reduces excess water usage. The modular and versatile mechanical system interface makes it easy to integrate and service in today's equipment facilities and meets the latest safety and monitoring requirements.

DI-O<sub>3</sub> improves cost of ownership (CoO) of the LTPS cleaning step and is more environmentally friendly than alternate cleaning methods like RCA and SPM. Using dissolved ozone during the LTPS process improves electron mobility, lowers leakage currents and lowers threshold voltages for Thin Film Transistors (TFTs), improving battery usage in OLED displays.

## Product Features

- 140 lpm DI-O<sub>3</sub> flow rate
- High outlet pressure compatibility, up to 3 bar<sub>g</sub>
- High purity ozone environment
- Integrated reference measurement for DI-O<sub>3</sub>
- Variable CO<sub>2</sub> doping
- Easy installation and operation



## Key Benefits

- Improves yield by effectively removing metallic and carbon contamination in LTPS applications
- Significantly improves cleaning process cost of ownership over alternate methods
- Number of outlets, pumps, filters, and sensors can be tailored to meet individual customer needs

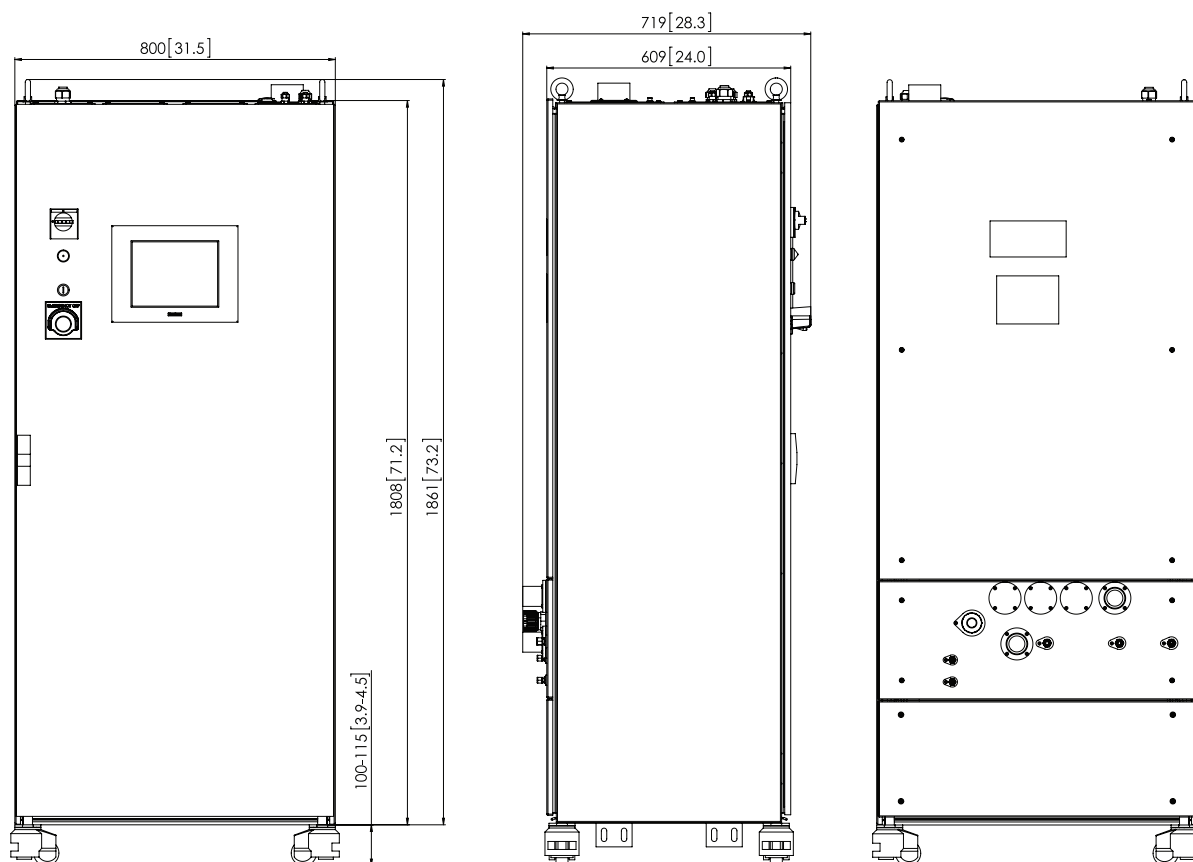
## Specifications

System Specifications	
<b>Ozonated Water Pressure</b>	Configurable 1.8-3.0 bar <sub>g</sub> flow rate depending, 120 lpm – max. 3 bar <sub>g</sub> ; 140 lpm max 2,5 bar <sub>g</sub>
<b>Plumbing Materials</b> <b>Liquid Wetted Surfaces</b> <b>Gas Wetted Surfaces</b>	<ul style="list-style-type: none"> <li>• PFA, PTFE, quartz glass</li> <li>• 316L stainless steel, PFA, PTFE</li> </ul>
<b>Communication</b>	Binary in/out, RS232/RS485, analog 4 – 20 mA in/out, USB
<b>Cabinet, Dimensions (H x W x D)</b>	Coated steel, approx. 1810 mm x 800 mm x 610 mm (71.2" x 31.5" x 24.1") Overall height: Approx. 2000 mm (79")
<b>Weight</b>	Approx. 315-400kg, depending on configuration
<b>Compliance</b>	CE, SEMI S2, SEMI F47, NRTL
Facility Requirements	
<b>O<sub>2</sub></b> <b>Inlet Pressure</b> <b>Flow Rate</b>	<ul style="list-style-type: none"> <li>• ≥Grade 4 (purity ≥99.99%)</li> <li>• 4.5 - 7.6 bar<sub>g</sub> (65 - 110 psig), at least higher 3 bar than system pressure</li> <li>• ≤15 slm, typ. 9 slm, according to SEMI E12 (0°C / 1.01325 bar)</li> </ul>
<b>Dopant Gas CO<sub>2</sub></b> <b>Inlet Pressure</b> <b>Flow Rate</b>	<ul style="list-style-type: none"> <li>• ≥Grade 4.5 (purity ≥99.995%)</li> <li>• 5.0 - 7.6 bar<sub>g</sub> (73 - 110 psig)</li> <li>• Typ. 0.15 - 0.5 slm, depending on the configuration</li> </ul>
<b>Ultra-Pure Water (UPW)</b> <b>Half Life Time of O<sub>3</sub> in UPW</b> <b>UPW IN Pressure (full flow)</b> <b>Temperature</b>	<ul style="list-style-type: none"> <li>• &gt;12 min @ 20°C, (which is standard in semiconductor fabs)</li> <li>• 1 - 4 bar<sub>g</sub> (14.5 - 58 psig)</li> <li>• 15 – 25°C (59 – 77°F), rated 20°C (68°F)</li> </ul>
<b>Cooling Water</b> <b>Quality</b> <b>Temperature</b> <b>Pressure</b> <b>Flow Rate</b>	<ul style="list-style-type: none"> <li>• Demineralized, filtration ≤20 µm</li> <li>• 17 – 23°C (63 – 73°F), rated 20°C (68°F)</li> <li>• Max. 5.0 bar<sub>g</sub> (73 psig); differential pressure ≥3 bar (43 psig)</li> <li>• Min. 10.0 L/min</li> </ul>
<b>Power</b>	3/PE~, 200 - 208 V ±10 %, 50/60 Hz, 3000 - 8000 W

Parameter	DI-O <sub>3</sub> Flow [L/min]	DI-O <sub>3</sub> Concentration [ppm = mg/L]	
		Min.	Max.
Specified achievable dissolved ozone concentration in UPW for a system pressure of 2.5 bar <sub>g</sub> , a cooling water temperature and UPW temperature of 20°C. At higher UPW temperatures, lower system pressure or higher cooling water temperature, the maximum performance will decrease.	10	25	90
	20	19	88
	50	10	55
	80	7	37
	100	5	30
	120	4	27
	140	3	25

Table 1 - Performance and operating range

## Dimensional Drawing



Note: Unless otherwise specified, dimensions are nominal values in millimeters (inches referenced). Back-plane design may vary according to chosen configuration.

## Ordering Information

Please contact your local MKS sales office for price and availability information.