High Concentration Hydrogen Peroxide Gas Delivery System

Safe, stable, consistent H_2O_2 gas delivery

The Peroxidizer vaporizer provides a safe, reliable way to deliver high-concentration hydrogen peroxide gas into ALD, annealing, dry surface preparation, and cleaning processes.

Peroxidizer Benefits

- Safely concentrates H_2O_2 from semiconductor grade 30% weight H_2O_2
- Flows H_2O_2 gas to process at up to 50,000 ppm, depending on flow rate
- Delivers high purity H_2O_2 without entrained droplets or decomposition
- Delivers low H_2O to H_2O_2 ratios

Benefits for Annealing and ALD

- Allows low temperature processing
- High oxide growth rates
- More reactive to metal-organic precursors
- Useful for in situ surface pre-cleaning
- Enables high-density, uniform hydroxylated surfaces
- Reduces number of defects

Benefits for Surface Preparation and Cleaning

- Delivers stable H_2O_2 gas at a wide range of concentrations to remove films and residues
- Cleans in situ, requiring less chemical than wet cleaning
- Oxidizes organic hydrocarbons and metals, enabling their removal
- Removes carbon contamination without damaging the surface

H_2O_2 Delivery Challenges

H_2O_2 presents a multitude of difficulties:

- Users wish to use standard two-component 30% weight H_2O_2
- Low volatility
- Easily condenses in the gas stream to form droplets, which can lead to particles on wafer surfaces
- Decomposes to form water and oxygen at elevated temperatures, undermining the use of hot-plate vaporizers
- Generates particles when used with flash vaporizers

Overcoming Raoult's Law

H_2O_2 gas has not been used extensively in oxidation, surface preparation, or cleaning applications because of the obstacle described by Raoult's Law. When a two-component solution is vaporized, the individual components will do so at different rates. In the case of 30% weight H_2O_2, the H_2O component vaporizes significantly faster than H_2O_2. H_2O dominates the vapor stream, and the H_2O_2 concentration is too low to be effective for the process.

Bubblers and traditional vaporizers do nothing to counteract the effect of Raoult's Law. If a carrier gas is bubbled through 30% weight H_2O_2 solution, less than 300 ppm of H_2O_2 will be delivered along with about 25,000 ppm of H_2O. For traditional vaporizers, high temperature operation leads to H_2O_2 decomposition. Lack of temperature control leads to entrained droplets.

For both bubblers and traditional vaporizers, the differential vaporization rate causes

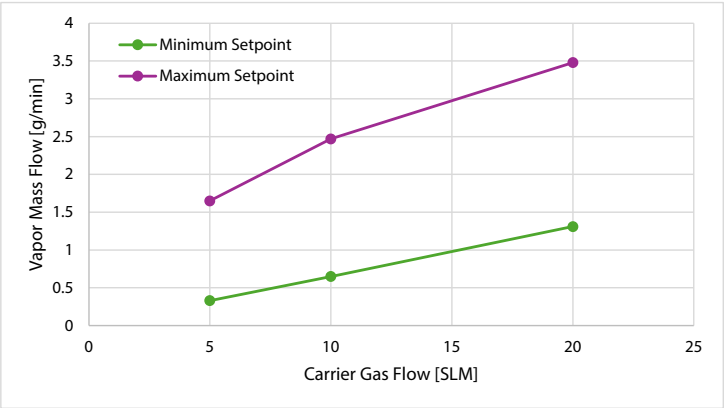


Figure 1 (left): H_2O_2/H_2O mass flow setpoints for a range of carrier gas flow rates. Contact RASIRC if calibration is needed outside this range.

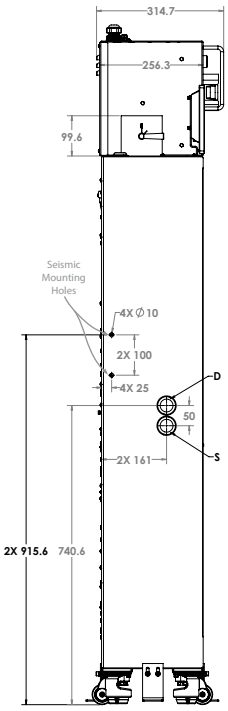
the liquid solution to concentrate and the composition of the process gas to constantly change. This prevents repeatable process control. Process recipes cannot be written around continuously changing mixtures.

The Peroxidizer vaporizer overcomes the issues of Raoult's Law by using a patented in situ liquid concentration method. Its unique vaporizer concentrates the liquid 30% weight H_2O_2 solution to a stable and consistent level that allows up to 50,000 ppm of H_2O_2 gas to flow to process along with H_2O at a ratio of four to one.

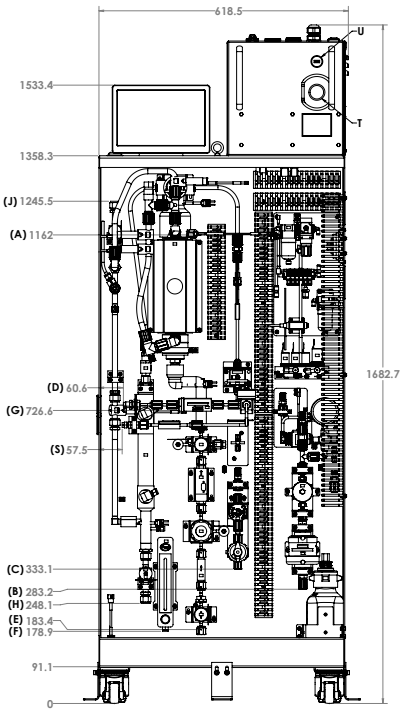
Table 1: Typical maximum H_2O_2/H_2O mass flow output using 30% H_2O_2 source

Carrier Gas (SLM)	H_2O_2 Vapor (ppm)	Total H_2O_2 and water mass flow (g/min)
5	50,000	1.65
10	40,000	2.47
20	30,000	3.48

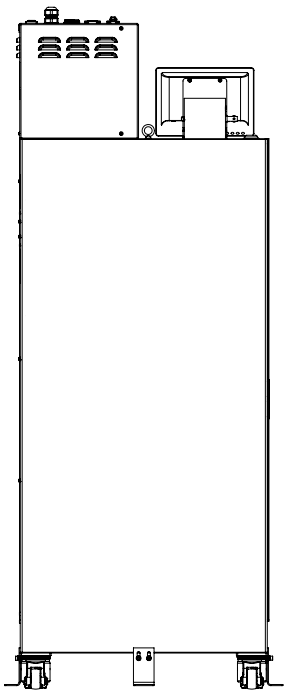
RASIRC PROPRIETARY - DO NOT COPY - Page 1
© 2026 *RASIRC*. All Rights Reserved. All product names and trademarks are property of their respective owners. (Document #120021-revAA).
RASIRC reserves the right to change this information at any time. For more information, contact RASIRC at (858) 259-1220 or info@rasirc.com.
Patented: www.rasirc.com/patents



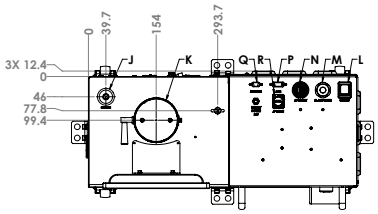
Chemical Cabinet
Side View



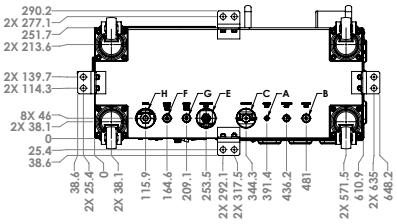
Chemical Cabinet
Front Internal View



Chemical Cabinet
Rear View



Chemical Cabinet
Top View



Chemical Cabinet
Bottom View

© 2026 *RASIRC*. All Rights Reserved. All product names and trademarks are property of their respective owners. (Document #120021-revAA).
RASIRC reserves the right to change this information at any time. For more information, contact RASIRC at (858) 259-1220 or info@rasirc.com.
Patented: www.rasirc.com/patents

Table 2: Peroxidizer Facilities

Description	Size/Type	Specification
Environmental Conditions	N/A	• Temperature: 17-24°C
Dry Weight	N/A	• 145 lbs (66 kg)
Dimensions	N/A	• Without Handles or Seismic Brackets: Approx. 1660 mm (H) x 617 mm (W) x 315 mm (D) • With Handles and Seismic Brackets: Approx. 1660 mm (H) x 687 mm (W) x 320 mm (D)
Instrument Gas Requirement (Item A)	1/4" Push-to-Connect Tube Fitting	• Nitrogen, argon, air • ISO Class 1 • Pressure: Min. 0.55 MPa, Max. 1 MPa • Temperature: 5-35°C
DI Water (Port B)	1/4" Flare, PFA	• Pressure: Min. 0.15 MPa, Max. 0.75 MPa • 17-18 MΩ resistivity • Filtered to 0.1 µm • Temperature: 17-24°C
Bulk H_2O_2 Solution (Optional, Port C)	1/4" Flare, PFA	• Pressurized facility H_2O_2 supply line (10-65 psig) • Semiconductor grade H_2O_2 aqueous solution • Solution concentration: 30-31% w/w
Carrier Gas Requirement (Port E)	1/4" Female VCR, SS	• Nitrogen, oxygen, air, or inert gas only • ISO Class 1 • Purity of 6N • Pressure: Min. 0.25 MPa, Max. 0.85 MPa • Mass flow controller included in the unit • Temperature: 17-24°C
Chilled Water (Ports F & G)	1/4" Compression, SS	• Pressure: Max. 0.55 MPa • Flow Rate: Min. 2 L/min • Temperature: Max. 25°C
Drain (Port H)	1/2" Compression, SS	• Atmospheric • Gravity drain • Compatible with up to 50% w/w liquid and vapor H_2O_2
H_2O_2/H_2O Vapor Vent Line (Port J)	1/2" Compression, SS	• Line should be at atmospheric pressure and connected to an H_2O_2 scrubber. Vent line must never be blocked.
Exhaust (Port K)	4" Duct Adapter	• 35-50 cfm @ -0.13 to -0.16 in H_2O, connected to an H_2O_2 monitor
Power Requirement (Port M)	N/A	• Customer tool to supply 100-120 VAC or 208 VAC with 10A overcurrent protection. Customer is to supply jacketed cable (13-18 mm OD) with 14-16 AWG wires: Line, Neutral, Earth.
Purge Gas Supply (Port S)	1/4" Male VCR, SS	• Nitrogen, oxygen, air, or inert gas only • ISO Class 1 • Purity of 6N • Pressure: Max. 0.069 MPa (10 PSIG) regulated by customer • User is responsible for purge gas flow control. MAXIMUM FLOW RATE is 5 SLM. • Temperature: 17-24°C

About RASIRC

RASIRC products generate and deliver water vapor, hydrogen peroxide, and hydrazine gas to enable critical processes.

© 2026 *RASIRC*. All Rights Reserved. All product names and trademarks are property of their respective owners. (Document #120021-revAA).
RASIRC reserves the right to change this information at any time. For more information, contact RASIRC at (858) 259-1220 or info@rasirc.com.
Patented: www.rasirc.com/patents