

Water-Free Hydrogen Peroxide Gas for Thin Film Processing

Enables lower processing temperatures & increased choice in precursors

RASIRC BRUTE Peroxide provides a breakthrough method to deliver virtually water-free hydrogen peroxide (H₂O₂) gas into Atomic Layer Deposition (ALD) and Etch (ALE) processes. BRUTE Peroxide solution is pre-loaded in a RASIRC vaporizer. This solution combines H₂O₂ liquid and a proprietary solvent, which ensures that the liquid source remains below 30% by weight H₂O₂.

RASIRC BRUTE Peroxide Benefits

- Provides H₂O₂ gas with minimal water
- Differentiates between H₂O₂ and water in process reactions
- Reacts faster and at lower temperatures than water
- Removes carbon and hydroxylates interface surfaces
- Improves compatibility with metal surfaces—less aggressive oxidant than ozone or O₂ Plasma
- Superior penetration into 3D high aspect ratio microstructures
- Allows high concentration H₂O₂ delivery into vacuum and low pressure applications
- Increases interface hydroxyl density on Si, Ge and SiGe films
- Enables in situ cleaning without liquid
- Proprietary delivery process, ensuring higher purity

Background

Oxidants such as oxygen, water, oxygen plasma, and ozone have all been used for cleaning and growing oxide in thin film processes. However, oxygen and water have low effectivity with today's lower thermal budgets. Ozone and plasma can be difficult to control and cause surface damage.

With RASIRC BRUTE Peroxide, H₂O₂ is now a superior alternative to these older chemical methods. H₂O₂ has a rapid and straightforward reaction pathway and lower pH for rapid proton transfer. BRUTE Peroxide overcomes historical concentration control issues by virtually eliminating water in the H₂O₂ solution.

Traditional water/H₂O₂ solutions produce relatively low H₂O₂ gas concentrations. Water vaporizes at significantly higher pressures compared to H₂O₂, causing continuous change in the ratio of water to hydrogen peroxide. Frequently misunderstood, the gas outputted at 30C and 1 atm of traditional 30% hydrogen peroxide solution is 300ppm, which is only 0.03% H₂O₂ gas by volume. The H₂O₂ partial gas pressure is about 0.22 torr.

In contrast, RASIRC BRUTE Peroxide now provides H₂O₂ partial pressure ranges from 0.4 to 3.6 torr with negligible water content.



Product Specifications

- Hydrogen peroxide (H₂O₂) gas pressure from 0.4 to 3.6 torr
- Vacuum or carrier gas flow rate up to 2000 sccm

Table 1: BRUTE Peroxide vs. Traditional Water : H₂O₂ Solutions (25°C, 760 torr) (based upon theoretical calculations)

| Solution Concentration (%w/w) | H ₂ O ₂ Concentration (ppm) | H ₂ O Concentration (ppm) |
|-------------------------------|---|--------------------------------------|
| 30 | 203 | 24131 |
| 50 | 533 | 17143 |
| 70 | 1142 | 9241 |
| BRUTE | 1514 | 151 |
| 90 | 2054 | 2405 |



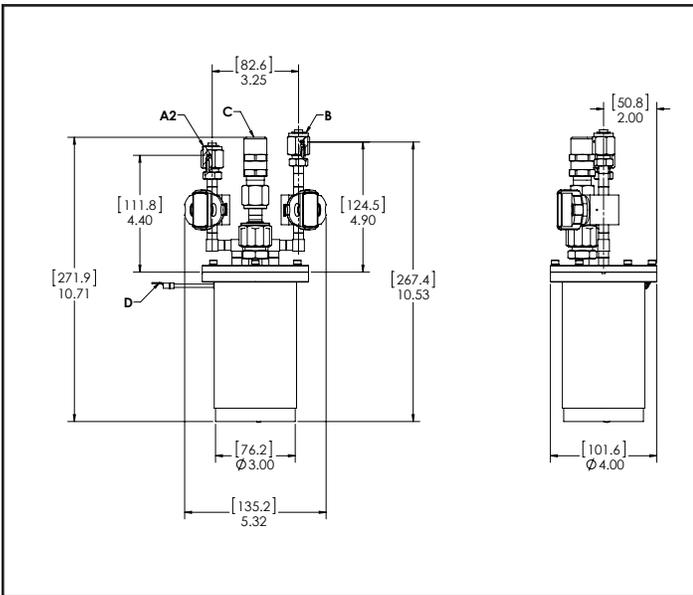


Figure 1: 300g BRUTE Peroxide, Standard Lid
P/N: 100746

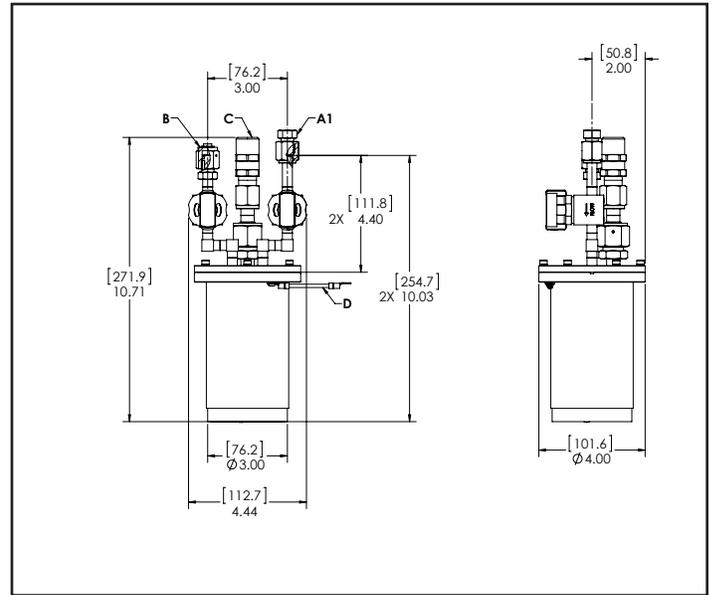


Figure 2: 300g BRUTE Peroxide, S2 Lid
P/N: 100741

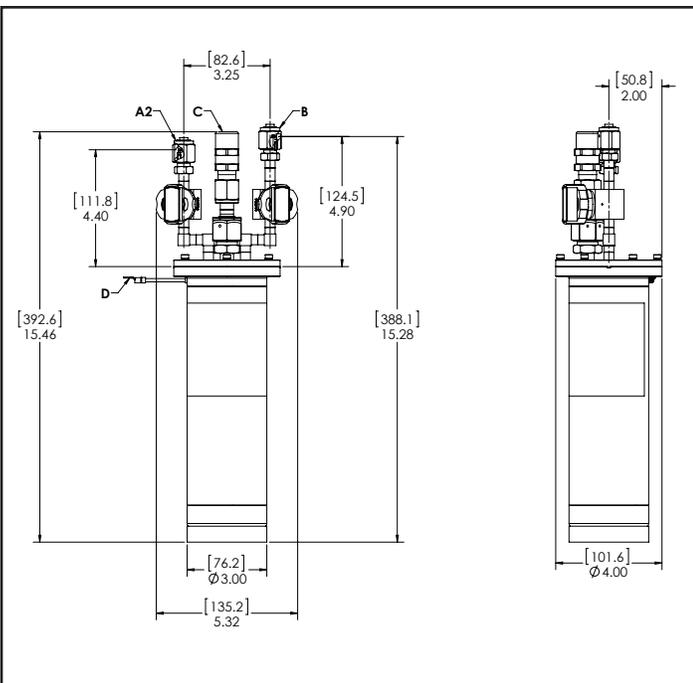


Figure 3: 900g BRUTE Peroxide, Standard Lid
P/N: 100747

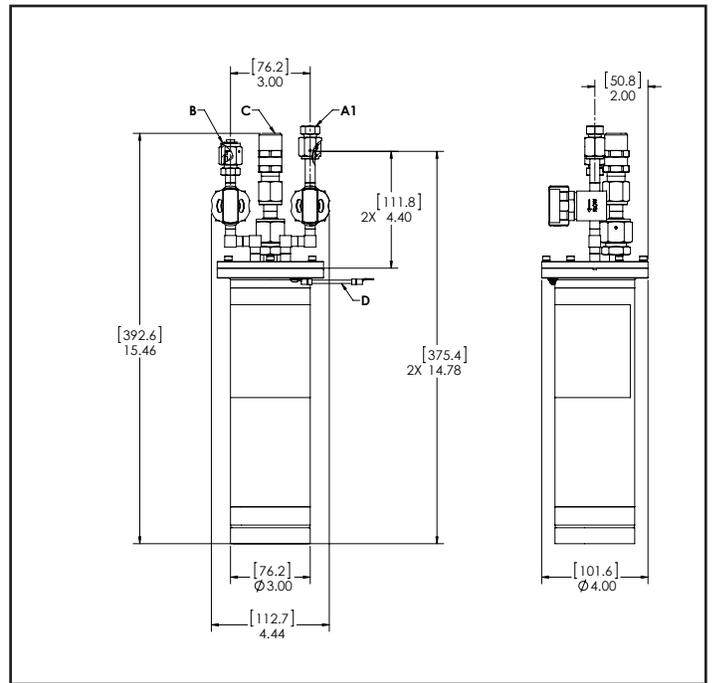


Figure 4: 900g BRUTE Peroxide, S2 Lid
P/N: 100742

| | Description | Size/Type |
|----|--------------------------|---|
| A1 | Inert Gas Inlet | 1/4" Female VCR |
| A2 | Inert Gas Inlet | 1/4" Male VCR |
| B | Process Gas Outlet | 1/4" Male VCR |
| C | Vent Relief Port | 3/8" Female NPT |
| D | Grounding Cable Assembly | 18" length of wire with M5 Terminal Ring (included with vaporizer) - Part number 201990 |

Table 2: Specifications

| | |
|--|--|
| Operating Conditions | <ul style="list-style-type: none"> Temperature: 10-40° C Max Pressure: 760 torr |
| Carrier Gas (optional) | <ul style="list-style-type: none"> 0-2000 sccm (user controlled MFC) Filtered to 0.003 µm Purified to < 1ppb contaminants CDA, Oxygen, Nitrogen or inert gas |
| H ₂ O ₂ Vapor Pressure | <ul style="list-style-type: none"> 3.6 torr at 40° C 1.3 torr at 25° C See Figure 5 for graph |
| Tools & Supplies Required | <ul style="list-style-type: none"> PPE (see SDS for BRUTE Peroxide RASIRC P/N 110153) (2) 1/4" SS VCR gaskets no silver plating (Swagelok PN: SS-4-VCR-2-VS) 3/4" and 5/8" wrenches |
| Required Facilities | <ul style="list-style-type: none"> Facility approved abatement system for H2O2 H2O2 safety gas monitor Electrical ground connection Proper ventilation |
| Shelf Life | <ul style="list-style-type: none"> 6 months at 25° C Shelf life can be extended if stored at 0-10° C |

How to Order

To place an order for **BRUTE Peroxide**:

1. Use Table 3 to identify the part number for the desired chemistry weight (g)
2. Use Table 4 to identify the part number for the corresponding chemistry weight (g) and lid type for the Vessel
3. Contact RASIRC at sales@rasirc.com.

Table 3: BRUTE Peroxide Chemistry

| Name | Mass of Solution | Part Number |
|----------------|------------------|-------------|
| BRUTE Peroxide | 300g | 100727 |
| BRUTE Peroxide | 900g | 100729 |

Table 4: BRUTE Peroxide Vessel Rental

| Name | Mass of Solution | Lid Type | Part Number |
|-----------------------|------------------|----------|-------------|
| BRUTE Peroxide Vessel | 300g | Standard | 100746 |
| | | S2 | 100741 |
| | 900g | Standard | 100747 |
| | | S2 | 100742 |

BRUTE Peroxide Vapor Pressure Curve

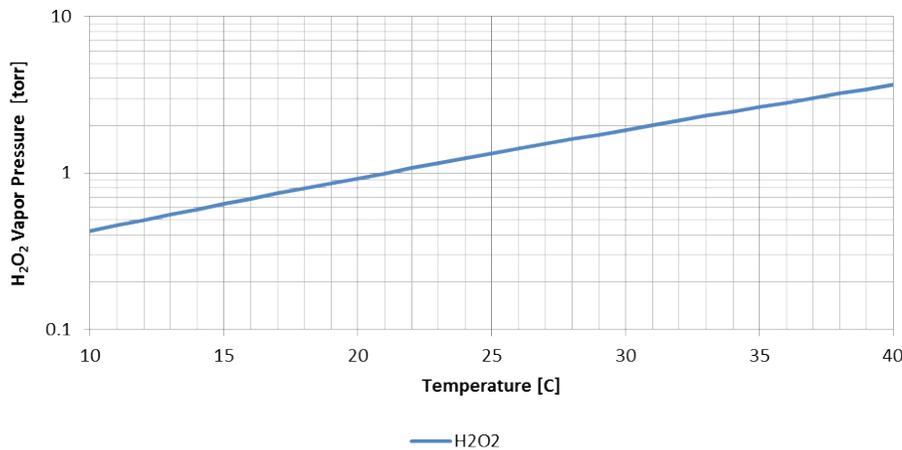


Figure 5: Vapor Pressure of H2O2 for BRUTE Peroxide based upon theoretical calculations

About RASIRC

RASIRC products purify and deliver ultra-pure gases from liquids. First to generate ultra-high purity (UHP) steam from de-ionized water, RASIRC technology now also delivers hydrogen peroxide gas in controlled, repeatable concentrations. It reduces cost, increases yield, and improves safety. RASIRC gas delivery systems, humidifiers, closed loop humidification systems, and steam generators are critical for many applications in semiconductor, photovoltaic, pharmaceutical, medical, biological, fuel cell, and power industries.

