

# Integrated unit for high flow rate steam generation and delivery

Flow rates up to 50 slm

The **RASIRC® Steamer** combines a clean steam generator, steam flow controller and steam purification assembly into a single system. All wetted components in the liquid path are quartz or Teflon®. The purified steam path components are quartz and Teflon® fittings and valves. The **RASIRC Steamers** are proven to increase oxide growth rate, chamber uniformity, film quality, and/or reduce operating cost when compared against all other steam technologies.

Tests show reduction of 67 different metals to below detectable limits. Some contaminants have been verified to less than 0.0005 parts per billion. Urea, Nitrogen and CO2 can also be greatly reduced. Because the **RASIRC Steamer** works with water vapor at low pressures, stainless steel delivery systems can be replaced with quartz and fluoropolymer piping systems.

There are two major components of the RASIRC Steamer:

- **RASIRC Steamer**—Steam generator that converts DI water into high flow, Ultra High Purity (UHP) water vapor, and controls DI water level and steam flow rate.
- **RASIRC SPA**—Purifier assembly that purifies clean steam to Ultra High Purity (UHP) steam by selective removal of dissolved gases, metals, and particulates to below levels of detection.

## Benefits of the RASIRC Steamer

The **RASIRC Steamer** is the only system that can provide controlled delivery of ultrapure steam from DI water. Some of the benefits include:

- **Purity**—Patent pending technology eliminates volatiles, ionic contaminants and other impurities, resulting in

equal to or better purity than pyrolytic steam created by burning oxygen and hydrogen.

- **Yield**—Metals, hydrocarbons, and particles are rejected by the non-porous membrane to deliver the purest steam possible.
- **Throughput**—Continuous unattended 24/7 operation. Up to 20% improvement in growth rate by elimination of carrier gases such as hydrogen and oxygen that can slow the growth rate. No thermal build up with increased flow rate as with pyrolytic torches.
- **Safety**—Eliminates H2 and O2 from the oxidation process, eliminating flammable and explosive materials. Operates at significantly lower temperature (below 125°C as opposed to above 500°C).
- **Cost of ownership**—Minimizes spares and consumables, and eliminates costly hydrogen and oxygen usage and storage. Low operating cost generates a rapid pay back and there is no cooling requirement unlike with torches.
- **Versatility**—Handles a wide range of flow rates and pressure levels.

## How It Works

- The heater generates steam from DI water.
- The flow rate is monitored by measuring the pressure drop across a sapphire orifice.
- The flow rate is increased or decreased by adjusting heater energy.
- A non-porous hydrophilic membrane within the RASIRC SPA purifies the steam, selectively allowing water vapor to pass. Selectivity is significant with up to 1,000,000x relative to nitrogen molecules. In the vapor phase, the



membrane selectively passes water molecules. All other molecules are greatly restricted, so contaminants in water such as dissolved gases, ions, TOCs, urea, particles, viruses, bacteria, pyrons, and metals can be removed in the steam phase.

- Water levels are constantly monitored and adjusted to ensure continuous steam flow.

## Product Specifications

- Flow up to 50 slm of water vapor
- Auto level / fill control
- Vacuum to 1200 Torr (0 to 23 psia)
- Manual and automatic operations
- PLC driven
- Remote and local control
- Secondary temperature control loop
- Downstream / upstream pressure sensing
- Patent pending flow control of steam
- Purge/drain capability
- Integrated purifier

## About RASIRC

RASIRC develops products that purify and deliver ultra pure liquids and gases, with a primary focus on water vapor. RASIRC steam generators, humidifiers and dryers are of critical importance for many applications in the semiconductor, photovoltaic, pharmaceutical, medical, biological, fuel cell, and power industries. Custom systems are available upon request. Call RASIRC to see how to solve your water vapor challenges.

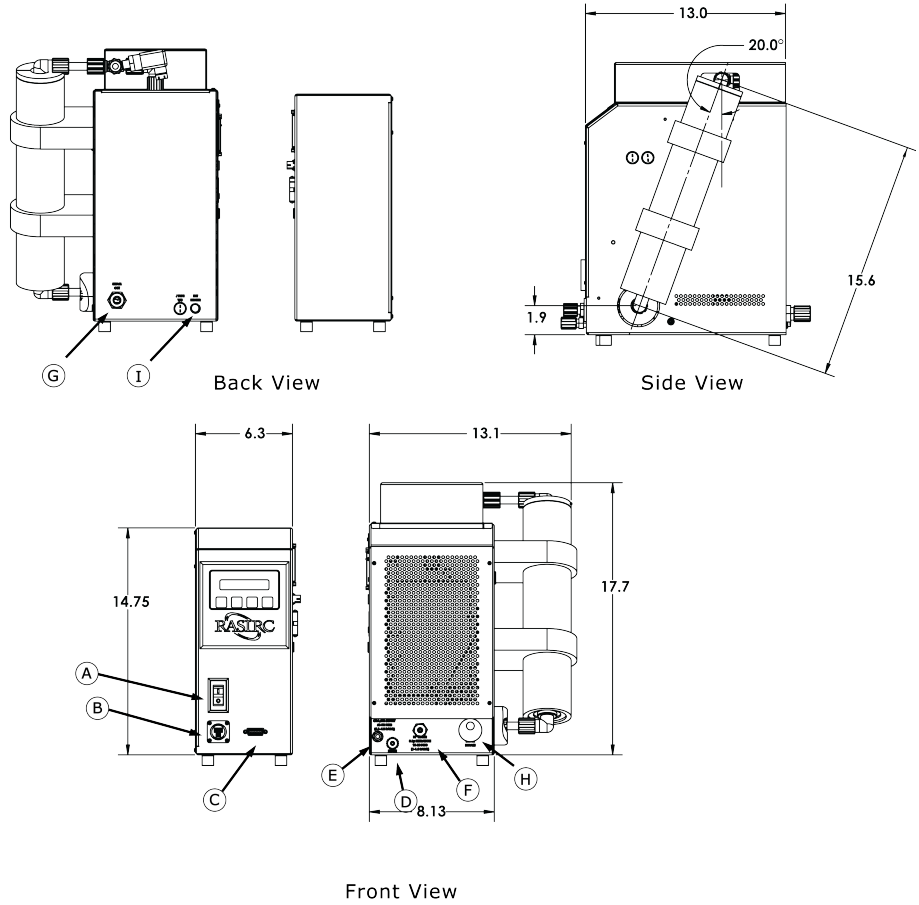


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Purification Performance Results (ppb)			
	DI Water Source	Pre-Purified Steam	Purified Steam
Total Metals	19.8	0.15	0.009
Total Organic Carbon	1200	380	22
Total Silica	28	4.3	0.7
Urea	2200	48	2.6
Ammonium	1.468	1.117	0.116

**Facility Specifications**

Environmental Conditions	<ul style="list-style-type: none"> <li>• 0°-40° Celsius</li> <li>• 30% to 90% humidity, non-condensing</li> <li>• Class 1000 cleanroom or tool cabinet</li> <li>• Protection of the unit from water leaks from surrounding process equipment</li> </ul>
Water	Regulated and filtered to 0.1 µm at 1-1.3 barg (15-20 psig), 18 megaohm DI water
CDA/N2	5.5 +/- 0.7 barg (80 +/- 10 psig) pressure requirement, filtered at 1 µm
Dry Weight	20.4 Kg (45 lbs)
Dimensions	372mm(w) x 450mm(d) x 467mm(h) 14.6in(w) x 17.7in(d) x 18.4in(h)
Tools & Supplies Required	<ul style="list-style-type: none"> <li>• 6mm (1/4") &amp; 12mm (1/2") Flaring tools</li> <li>• 6mm (1/4") &amp; 12mm (1/2") PFA tubing</li> <li>• Heaters for purified steam delivery line</li> </ul>
Drain	Minimum 1/2" system drain line 100°C
Power Requirement	200-240 VAC, 20A, single phase
Fuse	Circuit Breaker, 200-240 VAC, 20A



**How to Order**

To place an order for the **RASIRC Steamer**, simply identify the model number from the chart below based on your Flow Rate and Electrical Requirements.

Model #	Min Flow Rate (slm)	Max Flow Rate (slm)	AMPs	Voltage	Water @ 15 psig ml/min	CDA/N2
102B50	5	50	20	200-240	80	60 psig

Add a dash and designator from the options below.

Designator	Option
O	Standard cabinet
SC	Split cabinet. The split cabinet option allows the electronics to be re-moted up to 6 feet (2 meters) from the steam cabinet.
V	Vacuum to Atmospheric Delivery. 316L stainless steel pressure transducer is located downstream of the steam purifier on the steam process line to monitor downstream pressure. This provides the ability to control flow into vacuum and atmospheric processes and makes flow independent of atmospheric pressure fluctuations.
A	Atmospheric Delivery. The unit is designed to deliver to atmospheric process. Downstream pressure is based on pressure within the tool cabinet.

For example, to order a unit operating in a 208VAC environment with a split cabinet and atmospheric delivery, specify: 102B50-SCA.

**Additional optional components**

- DI Water Kit (100195)

Orders can be placed through authorized dealers or directly with the factory.

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This product may be covered by one or more of the following U.S. Patent(s) or U.S. Patent Application(s): #7625015 & 12/066254.

	Description	Size and Recommended Tubing
A	Power On/Off	Switch - 20A at 240VAC
B	Electrical Connection	TYCO Receptacle PN 206037-2
C	Remote Interface	DB 15 pin
D	System Drain	6mm (1/4") Male Flare—PFA or PTFE
E	Pneumatic Air CDA/N2	6mm (1/4") Push Lock Tube—PFA, PTFE or Poly
F	DI Water Inlet	6mm (1/4") Compression Tube—HP PFA
G	Process Steam Out	12mm (1/2") Male Flare—HP PFA
H	Bypass Steam Out	12mm (1/2") Male Flare PTFE or PFA
I	External Heater	200-240 VAC, 2A single phase



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