Integrated unit blends high flow rate steam with compressed gas

High velocity steam combined with heated compressed gas

The **RASIRC® Steamer Turbo** is the first RASIRC Steamer with integrated gas blending. This steamer is ideal for wafer cleaning and thinner thermal oxidation applications that require high flow rates of steam combined with compressed gas. The result is better uniformity, higher gas velocities, and greater momentum for particle movement after condensation.

The **Steamer Turbo** solves the common problem of condensation when blending steam with other gases. Before adding steam, blended gases are heated above the steam dewpoint, which is typically at least 105˚C but may be hotter in many applications that need to impart more energy to the wafer upon contact.

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.

The **Steamer Turbo** combines a clean steam generator, steam flow controller, steam purifier, and a heated gas blending controller into a single integrated package. All wetted surfaces in the liquid and purified steam path are quartz or Teflon®.

The integrated compressed gas control system within the **Steamer Turbo** includes a mass flow controller, regulator, filter and in-line gas heater, and can deliver up to 100 slm of compressed gas at 120˚C. The close coupling of the gas heater to the purified steam outlet ensures cleanliness and the virtual elimination of condensation. The dry gas wetted surfaces are all 316L stainless steel.

Benefits of the RASIRC Steamer

RASIRC Steamers are the only systems 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 that can slow the growth rate. No thermal build up with increased flow rate as with pyrolytic torches. In thin oxide applications, process times can be reduced from 100 minutes to less than 15 minutes for 1000Å films.
- **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 usage and storage. Low operating cost generates a rapid pay back and there is no cooling requirement unlike with torches. The ability to grow thin oxide quickly provides rapid return on investment.
- **Uniformity**—Significantly improves wafer to wafer uniformity by delivering high flows of diluted steam to process.

How It Works

- The heater generates steam from DI water.
- Flow rate is monitored by measuring the pressure drop across a sapphire orifice.
- Flow rate is increased or decreased by adjusting heater energy.
- A non-porous hydrophilic membrane purifies the steam, selectively allowing water vapor to pass. Selectivity is significant with up to 1,000,000x relative to nitrogen molecules.
- Water levels are constantly monitored and adjusted to ensure continuous steam flow.
- Heated compressed gas is delivered with the steam flow.
- Gas flow is regulated and controled with a mass flow controller.

Product Specifications

- Flow up to 50 slm of water vapor
- Auto level / fill control
- 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
- Integrated gas blending
- DI Water system includes water filter and pressure control valve
- Gas system includes regulator, shutoff valve, MFC and gas filter.

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

RASIRC®

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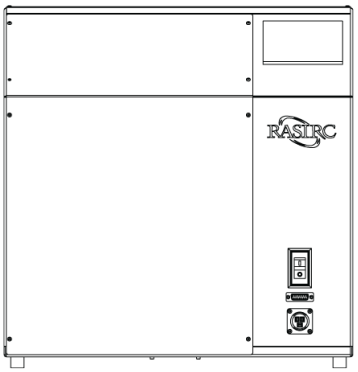
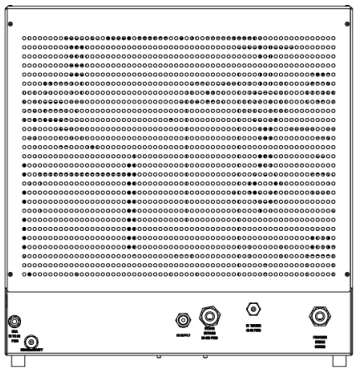
Facility Specifications

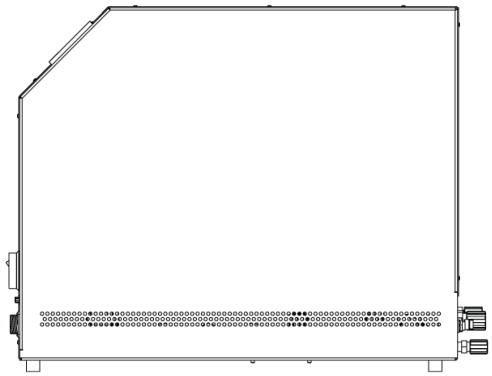
Environmental Conditions	• 5°-40° Celsius • 30% to 90% humidity, non-condensing • Class 1000 cleanroom or tool cabinet • Protection of the unit from water leaks from surrounding process equipment
Water	1-6.8 barg (30-100 psig) 18 megaohm DI water
UHP Diluent	3.4 barg ± 0.7 barg (50 psig ± 10 psig)
CDA/N2	5.5 ± 0.7 barg (80 ± 10 psig) pressure requirement, filtered at 1 µm
Dry Weight	46 Kg (101 lbs)
Dimensions	500mm(w) x 622mm(d) x 508mm(h) 19.6in(w) x 24.5in(d) x 20in(h)
Tools & Supplies Required	• 6mm (1/4") & 12mm (1/2") Flaring tools • 6mm (1/4") & 12mm (1/2") PFA tubing • Heaters for purified steam delivery line
Drain	Minimum 1/2" system drain line 100°C
Power Requirement	200-240 VAC, 20A, single phase
Fuse	Circuit Breaker, 200-240 VAC, 20A



Front View



Back View



Side View

Description	Size and Recommended Tubing
Power On/Off	Switch - 20A at 240VAC
Electrical Connection	TYCO Receptacle PN 206037-2
Remote Interface	DB 15 pin
System Drain	6mm (1/4") Male Flare—PFA or PTFE
Pneumatic Air CDA/N2	6mm (1/4") Push Lock Tube—PFA, PTFE or Poly
DI Water Inlet	6mm (1/4") Compression Tube—HP PFA
Process Out	12mm (1/2") Male Flare—HP PFA
Bypass Out	12mm (1/2") Male Flare—HP PFA or PTFE
Pneumatic Port	4mm (5/32") Push Lock Tube—PTFE or Poly
External Heater	200-240 VAC, 2A single phase
UHP Diluent	1/2" VCR

How to Order

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

Model #	Min Flow Rate (slm)	Max Steam Flow Rate (slm)	Max Diluent Flow Rate (slm)	AMPs	Voltage
102T-B50	5	50	100	20	200-240

Add a dash and designator from the options below.

Designator	Option
N2	Nitrogen
O2	Oxygen

For example, to order a unit operating in a 208VAC environment and blending with nitrogen, specify: 102T-B50-N2.

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

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