

Tank Specifications

Model	Liquid Capacity (liters)	Capacity (wafer boats)	Process Vessel Internal Dimensions (In.)		
			Length	Width	Depth
QRT/S-A1002-11	11	2 - 100mm	11.5	7.5	7.8
QRT/S-A1252-14	14	2 - 125mm	13.5	7.5	8.6
QRT/S-D1501-13	13	1 - 150mm*	9.9	8.6	9.5
QRT/S-A1502-18	18	2 - 150mm	16.0	8.0	9.6
QRT/S-A2001-25/11	25	1 - 200mm	12.0	11.0	11.5
QRT/S-A2001-25/12	25	1 - 200mm	11.0	12.0	11.5
QRT/S-B2001-34	34	2 - 150mm or 1 - 200mm	16.0	10.5	12.0
QRT/S-A2002-51	51	2 - 200mm	21.5	11.5	12.5
QZ-A1002-11	11	2 - 100mm	11.5	7.5	7.8
QZ-A1252-14	14	2 - 125mm	13.5	7.5	8.8
QZ-A1254-27	27	4 - 125mm	13.5	13.5	9.1
QZ-A1501-10	10	1 - 150mm	7.8	7.8	9.8
QZ-A1502-18	18	2 - 150mm	16.0	8.0	9.8
QZ-A2001-25	25	1 - 200mm	12.0	11.0	11.7
QZ-B2001-34	34	1 - 200mm	16.0	10.5	12.2
QZ-A2002-51	51	2 - 200mm	21.5	11.5	12.5

Model	Required Mounting Clearance (in.)			Approx. Deck Clearance (in.)		Power (nominal, at 208V)
	Length	Width	Depth	Length	Width	Watts
QRT/S-A1002-11	19.1	10.9	10.5	20.1	11.9	3073
QRT/S-A1252-14	21.1	10.9	11.2	22.1	11.9	4089
QRT/S-D1501-13	17.5	12.0	12.2	18.4	13.0	1773
QRT/S-A1502-18	23.7	11.5	12.1	24.7	12.5	4326
QRT/S-A2001-25/11	21.1	14.4	14.0	22.3	15.6	4120
QRT/S-A2001-25/12	19.6	15.4	14.0	20.8	16.6	4120
QRT/S-B2001-34	23.6	13.9	14.4	24.8	15.1	5878
QRT/S-A2002-51	29.9	14.9	14.8	31.1	16.1	7092
QZ-A1002-11	14.0	10.0	12.7	15.0	11.0	2242
QZ-A1252-14	16.0	10.0	13.7	17.0	11.0	2242
QZ-A1254-27	16.0	16.0	14.0	17.0	17.0	2738
QZ-A1501 -10	10.3	10.3	14.7	11.3	11.3	1518
QZ-A1502-18	18.5	10.5	14.7	19.5	11.5	2622
QZ-A2001 -25	14.5	13.5	16.6	15.5	14.5	3101
QZ-B2001 -34	18.5	13.0	16.7	19.5	14.0	2996
QZ-A2002-51	24.0	14.0	17.3	25.3	15.3	5700



UNIQUE BOILING POINT CONTROL

IMTEC's QN Nitride-Etch Accubath system provides the industry's tightest, most predictable process control. This state-of-the-art control is by far the most effective, reliable and safest method for Si₃N₄ etching. Our company has accomplished this procedure by providing actual acid concentration and boiling-point control in an extremely efficient self-balancing reflux system.

DESIGN CONCEPT

The customer-selected process temperature for the desired nitride etch rate and selectivity is best attained by a balance of three factors: optimum (high) process temperature, acid concentration and the highest water fraction. (Highest water fraction for a selected process temperature is coincident with the chemistry boiling point.)

In nitride-etching, a specific acid concentration is picked for selectivity - and semiconductor process is then conducted for fastest etch rate for that acid concentration at the highest attainable temperature (at standard pressures): its boiling point.

We have developed a special nitride controller that senses and maintains the chemistry boiling point (rather than the process bath temperature). IMTEC's advanced controller provides the manipulation of the significant nitride-etch control parameters: the phosphoric acid concentration, boil rate and boiling point temperature.

CUSTOMER BENEFITS

The unique new quartz-nitride control system from IMTEC provides the semiconductor process user with the following twin benefits:

- Process uniformity.
- Lot-to-lot repeatability.

PREVENTS STRATIFICATION

IMTEC's well-tested and proven control technique virtually eliminates the all-too-common problem of semiconductor bath stagnation which results from the loss of boil. The previous safety risks of water stratification become insignificant when using our control system.

QUARTZ NITRIDE REFLUX SYSTEM

PROCESS INTEGRITY OPTIMIZED SEMICONDUCTOR WAFER-ETCH PROCESS FOR THE HIGHEST ETCH RATES.

- **CONTROL:** The preset process boiling point is maintained to + 0.2°C.
- **STABILITY:** Keeps the correct phosphoric acid (H₃PO₄) concentration and boil rate.
- **ACCURACY:** Monitored by RTD standard process sensor (thermocouple optional).

THERMAL UNIFORMITY HEATING:

- **Heating:** Inconel heaters - sized, shaped and located to give uniform boiling rate throughout the tank. Temperature uniformity at the boil condition is better than 0.5°C with the boiling point kept within 0.2°C.
- **INSULATION:** Alumina-silica, integrated with the bath and heater design to conserve energy and contribute to uniform heat distribution.

RELIABILITY

- **Experience:** 20-plus years in quartz vessel design and manufacturing, consistently supplying state-of-the-art products.
- **Heaters:** Patented, long-life design.
- **Reduced Cycling:** Efficient condensing helps to maintain stability of chemical concentration and smoothes “bang-bang” heating cycles.
- **Redundant over-temperature sensors.**

QN ACCUBATH

Safety (3 Redundant Shutdown Mechanisms)

- **Auto-Shutdown:** If the Accubath system either over-temps by 5°C from the preset process temperature without achieving boil or does not correct Accubath to within 0.2°C of the process set-point within five (5) minutes of exceeding that specific set-point condition, the controller shuts-down the process and also places the controller into “Hold” condition.
- **Over-Temperature Shutdown:** T/C-activated. Two thermo couples -1 active and 1 spare. Supplementary Shutdown: A “Snap-switch” over-temp shutdown at 210°C, independent of thermocouple signals to controller.
- **Alarm:** The controller “Hi-Acid Concentration” alarm flashes “HI” and sounds anytime the acid concentration raises the boiling point 0.8°C in excess of predetermined process set-point.
- **Fire-Resistant:** Features a self-extinguishing polypropylene housing with no air gap between the tank and housing, eliminating flame space.

CONFIGURING A QN SYSTEM

Configuring a Quartz Nitride system requires that it be a “closed bath”. Starting with a standard IMTEC QZ or QRT/S tank, add a quartz collar and lid. The collar is water-cooled, using integrated condensing coils. A flowmeter regulates cooling. IMTEC’s 952 Controller is used with the QN system.

COLLAR (LID CHOICES)

The water-cooled quartz collar must be utilized with a lid. IMTEC offers side or end-opening Autolids (water-pressure-driven; reed

switches indicate “Closed” and “Full Open” positions to customer’s robot system). Autolid incorporates a chemically impervious membrane. Alternatively, IMTEC can supply a similarly constructed manual hinged lid.

FLOW METER

A dual-panel flowmeter regulates the cooling water to the collar and sets the rate of the liquid drip into the semiconductor process bath which is then automatically adjusted and controlled by the QN controller.

CONTROLLER

IMTEC’s Model 952 is the designated controller for our quartz nitride systems. Its unique software senses, adjusts and controls the boiling point of the process chemistry. The 952 Controller is extremely simple to use: all of the interfaces are pre-wired for nitride etch applications. (All of the required system components and their interfaces are provided.) Read the instructions, select the desired process parameters - and you can literally PLUG-AND-GO!

952 OPERATION – CONTROL PANEL

This process controller uses a special software protocol as part of the IMTEC proprietary control algorithm. A photo-isolated 20 amp triac powers the bath heater. (Nitride baths requiring more than 20 amperes utilize power-switching relays - these may be supplied by the customer or by IMTEC as a power module.) D.I. water solenoid is actuated by a controller 24-VAC relay driver output. A 100-ohm RTD (Resistance Temperature Detector) monitors the bath temperature. The RTD is usually inserted through an access port provided in the Accubath

condensing collar. Upon request, IMTEC will configure instrumentation ports in the collar to conform to the user’s specification.

CONTROLLER DISPLAYS

Two front-panel digital displays continuously show actual bath temperature and timer status during normal process operations. By pressing a button, the user can always call up the process set-point temperature. While setting up or in non-standard state, these primary digital displays also show other information whose access (as well as ability to change) may be controlled by restricted security codes. In addition, 12 indicator (LED) displays are provided to show system and process status (6) and alarm (6) conditions.

952 SWITCHES

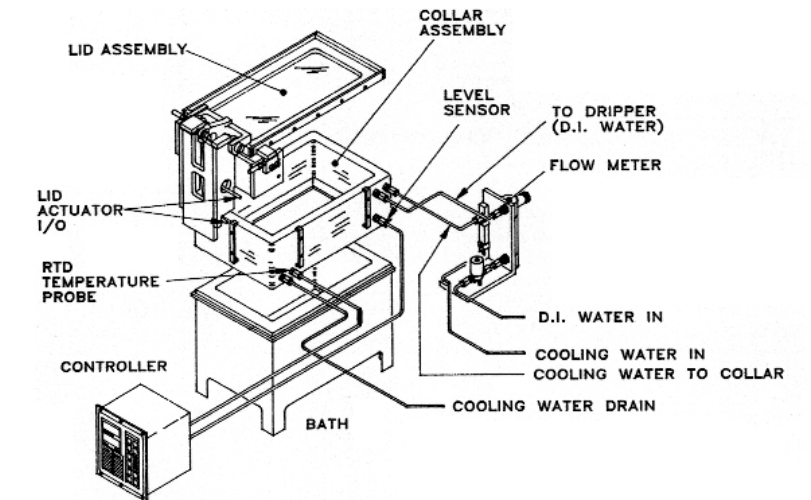
Twelve membrane switches provide front panel control of the power, setup and timer operations; the switches are clustered in three corresponding functional groups.

RTD TEMPERATURE SENSOR

An 100-ohm, Teflon®-encapsulated, platinum-wire Resistance Temperature Detector [RTD] calibrated to the American standard (0.003916 ohm/ohm/°C) is supplied by IMTEC as the recommended nitride process temperature sensor. The utilization of J-type thermocouples is optional and must be customer-specified at the time of ordering the controller.

LIQUID LEVEL SENSORS

Two liquid level sensors can be used with their sensing probes mounted in a “High-Low” tank configuration. This will prevent overflow of bath solution and also



will provide a prompt alarm of a low-chemistry condition during process.

DISPERSION PLATES

A dispersion plate can be mounted in bottom of a QRT/S bath process vessel to provide improved flow distribution of the incoming filtered chemistry. Also, the liquid dispersion plate may have a gas manifold added if nitrogen or other gas agitation should be desired.

FUNCTIONAL PERFORMANCE

- Controller Temperature Range:** 0° to 249.9°C
- System Operating Temperature Range:** 28°to 190°C.
- Controller Temperature Resolution:** 0.1°C.
- Process Set-Point (Boiling Point) Accuracy:** +-0.2°C
- Bath Liquid Temperature Uniformity at Boil:** +-0.5°C

MATERIALS

- Process Tank and Cooling Collar:** Virgin quartz, annealed
- Tank Enclosure:** Flame-retardant polypropylene (fume and liquid-tight closure)
- Heating Element:** Stamped Inconel element bonded directly to quartz tank.
- Insulation:** Refractory alumina-silica.
- All Wiring:** Teflon®-insulated.

ELECTRICAL SERVICE

200-240 VAC†, single-phase, 50/60 Hz, up to 20 ampt††.

†Available option: 24-VAC switching remote relays.

††For IMTEC nitride baths drawing more than 20 amperes and for 24-VAC switching, special circuitry requirement data is available from our Engineering Department; also, IMTEC-designed relay modules are available.

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