**SYSTEM OVERVIEW**

The Kinetics UPW 300 Water Purification System is an ultra-high purity turnkey water purification system, targeted for semiconductor device processing. The system produces consistently clean water, up to a resistivity of 18.2 MΩ·cm. Using a combination of reverse osmosis, electro-deionization, degasification and mixed bed polishing technology, the system carefully controls the levels of dissolved solids, TOC, silica, particles, dissolved oxygen and critical metals to as low as 0.002 ppb. With a make-up stage capacity of 5, 10, or 17 M³/hour, the UPW 300 system can be configured for several capacity ranges at the polishing stage. A combination of standard and optional instrumentation provides the data to ensure a consistent level of water purity, on a continuous basis.

**KEY FEATURES:**

- Fully-automated operation
- Independent local PLC controllers on RO, EDI and UV units
- Water Softening Unit prior to RO module
- Reverse Osmosis Unit, for molecular impurity removal
- Membrane Degasifier, to removed dissolved CO₂
- Electro-deionization unit, for removal of ionic contaminants
- UPW storage tank, with DI return line
- UV disinfection, to remove bacterial contaminants
- Two mixed-bed ion exchange modules
- Final Ultrafiltration Module (6000 Dalton MWCO)
- Instrumentation for temperatures, pressures, unit flow rates, conductivity, and tank levels

**OPTIONS:**

- Buffer tanks for softened water and RO permeate
- Anti-scalant dosing module, for protection of RO membrane
- Redundant modules for pumps, electro-deionization and final filtration units
- Heat exchangers on pre-treatment and polishing stages, to improve system economy
- On-line instruments for measurement of TOC, particles, and silica
- Neutralization and reclamation of DI water from process operations
- Centralized PLC controller and graphical user interface
UNIT OPERATIONS

- **RO Pre-treatment**: Chemicals added to reduce calcium, magnesium, chlorine and scale-formation that impede the RO membrane
- **Reverse Osmosis**: A semi-permeable membrane removes salts and dissolved impurities
- **Degasification**: Membrane contactors remove dissolved CO₂
- **UV Disinfection**: Ultraviolet light removes viable organisms
- **Mixed Bed Ion Exchange**: Removal of dissolved ions at two locations
- **Final Filtration**: Ultrafiltration module removes fine particles with 6000 Dalton MWCO

CONTROLS

- **Standard configuration utilizes local, independent PLC controllers on the RO, EDI and UV Disinfection modules**
- **Options for centralized PLC and HMI Graphical Interface, displaying the following parameters:**
  - Process Flow Diagrams
  - System P&ID status
  - Adjustment of Reverse Osmosis parameters
  - Values of flow rate and filtration pressure
  - Alarm & Maintenance Screens

FACILITY REQUIREMENTS

<table>
<thead>
<tr>
<th>Utility</th>
<th>Requirement</th>
<th>Connection Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Power</td>
<td>380 Volt, 50 Hz, 3 ph, 6-20 Amps</td>
<td>¼” conduit</td>
</tr>
<tr>
<td>CDA</td>
<td>4 - 45 SCFM, 90 psi (6 - 70 Nm³/hr @ 6 barg)</td>
<td>SS Swagelok or similar</td>
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<tr>
<td>Chilled Water</td>
<td>44 GPM, max @ 72 psi (10 M³/hr @ 5 barg), 6 - 15 °C</td>
<td>Flange or Threaded, 1” – 4”</td>
</tr>
<tr>
<td>Influent Water</td>
<td>35 – 125 GPM @ 70 – 100 psi (8 - 28 M³/hr @ 5 – 7 barg), 5 - 20 °C</td>
<td>Flange or Threaded, 2” – 5”</td>
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<tr>
<td>Nitrogen</td>
<td>12 SCFM, max @ 85 psi (18 Nm³/hr @ 6 barg)</td>
<td>SS Swagelok or similar</td>
</tr>
<tr>
<td>Sanitary Drain</td>
<td>48 GPM, max (11 M³/hr, max), Gravity</td>
<td>Flange or Threaded, 1” – 2½”</td>
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</tbody>
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Specifications

- **Application**: Generation of ultra-pure water (UPW) for microelectronic applications, with potable water as influent source
- **Make-up Stage Capacity**: 5, 10, or 17 M³/hour
- **Polishing Stage Capacity**: Variable, according to client-demand

**Influent Water Specification**

- Temperature: 5-20 °C, pH: 6.5-8
- Pressure: 70 – 100 psig (5-7 barg)
- Total Dissolved Solids (TDS): ≤ 250 mg/L
- Total Organic Carbon (TOC): ≤ 1 mg/L
- Copper (Cu) and Iron (Fe): ≤ 0.05 mg/L each
- German Hardness (GH): ≤ 20°

**Effluent Water Quality, Point-of-Supply**

- Resistivity: ≥ 18.2 MΩ cm
- TOC: ≤ 1 ppb
- Silica: ≤ 1 ppb
- Dissolved Oxygen: < 3 ppb
- Temperature: 25 ± 2 °C
- Pressure: 80 ± 5 psig (5.5 ± 0.5 barg)
- Final Ultrafiltration

**Buffer Tank Sizes**

- Variable, according to client-demand

**Component Materials**

- PVC for pre-treatment and softening modules
- Polypropylene for tanks, make-up piping and valves
- PVDF-HP for polishing piping, valves and filter housings
- SS for make-up filter housings, centrifugal pumps, and UV module
- FRP for RO Pressure Vessels

**Utility Requirement Connection Type**

1) Maximum impurity levels allowable for influent water in order to meet effluent quality levels