

# KINETICS UPW 300

## Ultrapure Water System, Ultra-High Purity

- Effective — meets requirements for semiconductor device processing
- Consistent — targeted system sizing, redundant components
- Efficient — proven unit operations, optimized system integration

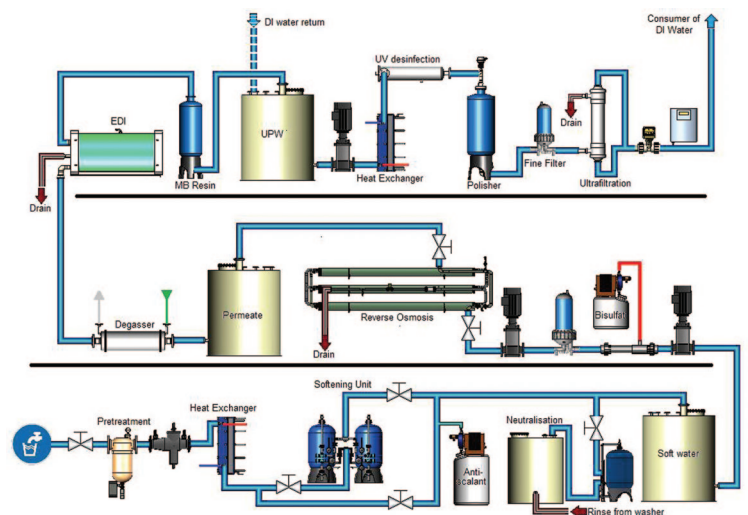
### SYSTEM OVERVIEW

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 M<sup>3</sup>/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 CO<sub>2</sub>
- 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

### PROCESS FLOW DIAGRAM



Process Flow Diagram, with Optional Unit Operations

### 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

# TECHNICAL DATA



## 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 CO<sub>2</sub>
- *Electro-Deionization:* Removes ionic species using electrically-active media and electrical current
- *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

## SPECIFICATIONS

PARAMETER	CAPABILITY
Application	Generation of ultra-pure water (UPW) for microelectronic applications, with potable water as influent source
Make-up Stage Capacity	5, 10, or 17 M <sup>3</sup> /hour
Polishing Stage Capacity	Variable, according to client-demand
Influent Water Specification <sup>1</sup>	<ul style="list-style-type: none"> <li>• Temperature: 5-20 °C, pH: 6.5-8</li> <li>• Pressure: 70 – 100 psig (5-7 barg)</li> <li>• Total Dissolved Solids (TDS): ≤ 250 mg/L</li> <li>• Total Organic Carbon (TOC): ≤ 1 mg/L</li> <li>• Copper (Cu) and Iron (Fe): ≤ 0.05 mg/L each</li> <li>• German Hardness (GH): ≤ 20°</li> </ul>
Effluent Water Quality, Point-of-Supply <sup>2</sup>	<ul style="list-style-type: none"> <li>• Resistivity: ≥ 18.2 MΩ cm</li> <li>• TOC: ≤ 1 ppb</li> <li>• Silica: ≤ 1 ppb</li> <li>• Dissolved Oxygen: &lt; 3 ppb</li> <li>• Temperature: 25 ± 2 °C</li> <li>• Pressure: 80 ± 5 psig (5.5 ± 0.5 barg)</li> <li>• Final Ultrafiltration</li> </ul>
Buffer Tank Sizes	Variable, according to client-demand
Component Materials	<ul style="list-style-type: none"> <li>• PVC for pre-treatment and softening modules</li> <li>• Polypropylene for tanks, make-up piping and valves</li> <li>• PVDF-HP for polishing piping, valves and filter housings</li> <li>• SS for make-up filter housings, centrifugal pumps, and UV module</li> <li>• FRP for RO Pressure Vessels</li> </ul>

<sup>1</sup>Maximum impurity levels allowable for influent water in order to meet effluent quality levels  
<sup>2</sup>Partial Specification, for complete specification, refer to Kinetics Document entitled, "Water Quality Specification for UPW Products". Specification based on ASTM Standard D5127-07, Type E-1.2.

## FACILITY REQUIREMENTS

UTILITY	REQUIREMENT	CONNECTION TYPE
Electrical Power	380 Volt, 50 Hz, 3 ph, 6-20 Amps	¾" conduit
CDA	4 – 45 SCFM, 90 psi (6 – 70 Nm <sup>3</sup> /hr @ 6 barg)	SS Swagelok or similar
Chilled Water	44 GPM, max @ 72 psi (10 M <sup>3</sup> /hr @ 5 barg), 6 - 15 °C	Flange or Threaded, 1" – 4"
Influent Water	35 – 125 GPM @ 70 – 100 psi (8 – 28 M <sup>3</sup> /hr @ 5 - 7 barg), 5 - 20 °C	Flange or Threaded, 2" – 5"
Nitrogen	12 SCFM, max @ 85 psi (18 Nm <sup>3</sup> /hr @ 6 barg)	SS Swagelok or similar
Sanitary Drain	48 GPM, max (11 M <sup>3</sup> /hr, max), Gravity	Flange or Threaded, 1" – 2½"