Kinetics Modular Gas Delivery Systems
THE MODULAR SYSTEM - History

• 1995 - Unit Instruments, Inc. introduced Z-Block Modular system for Semiconductor marketplace
• 1997 - Increasing acceptance of modular technology in semiconductor due to new tool designs and wider availability of modular components
• 1999 - Kinetics purchases Unit Instruments, Inc. and places in Fluid Systems Division; purchase includes IP of a new modular system design
• 1999 - Kinetics Fluid Systems introduces patented K1 platform (1.5” width) for modular systems which reduces size, weight and cost of existing modular designs while simultaneously increasing flexibility for design and manufacturing.
• 2001 - Expansion of K1 platform to include narrow and high flow products.
Advantages of Modular

- Significant space savings over conventional systems
- Smaller gas path reduces purging times
- Shorter design lead times due to Gasware (design tool developed by Kinetics); provides “drag and drop” configuration as well as automated bill of materials and cost information
- Flexibility to make changes in panel configuration during design process; reduces/eliminates time and cost impact
- Shorter production lead times because most applications are made from a small number of standard components; configure to order from stock
- Reconfiguration of gas stick in the field is possible
- Simple and quick replacement of components reducing cost of ownership
QUOTE

“...cost of ownership is also important. Currently, one technician supports around 50 sample system in the field. With new generation of sampling systems, we can increase that number to 60 or 70”

Peter Van Vuuren; Exxon/Mobil Intech Magazine, August 2001
## KINETICS MODULAR OFFERING

<table>
<thead>
<tr>
<th>Model</th>
<th>Substrate Width</th>
<th>Tubing Equivalent</th>
<th>Seals Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1S</td>
<td>1.125”</td>
<td>1/4”</td>
<td>Elastomer or Metal Seals</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4-32 rA surface finish)</td>
</tr>
<tr>
<td>K1</td>
<td>1.5”</td>
<td>1/4”</td>
<td>Elastomer or Metal Seals</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4-32 rA surface finish)</td>
</tr>
<tr>
<td>K1H</td>
<td>1.5”</td>
<td>3/8”</td>
<td>Elastomer or Metal Seals</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4-32 rA surface finish)</td>
</tr>
</tbody>
</table>
Modular for Industrial Process Control

- Adopted proven technology from semiconductor industry
- Adapted to requirements in industrial market segments
  - Reduction of overall cost by eliminating unnecessary requirements
  - Surface finishes of 16-32 rA
  - Addition of Elastomer seals (Viton, Buna N, neoprene)
  - Helium leak integrity at $1 \times 10^{-9}$ Atm-cc/second
Modular Terms (cont.)

- **Versa Plane** – A universal mounting plate upon which Kinetics modular sticks are mounted. This universal design allows easy reconfiguration of the gas sticks.
- **“C” Seal** – Metal seal used to seal the interface between components and the modular substrates.
- **Elastomer Seal** – Flexible elastomer seals used to seal the interface between components and modular substrates; standard offerings are Viton, Buna N, Neoprene.
- **M4 Screws** – The 4mm metric fasteners which hold the active components on the substrate.
Types of Blocks

• 17 Blocks configurations cover all design requirements
  – 3 Types for Component Mounting
  – 3 Types for routing of purge/outlet manifolds
  – 4 Types for Gas Inlet/Outlet
  – 2 Types for Gas Connections
  – 5 Lengths of Manifolds

• Allows for easy configuration from stock parts
Basic K1S Block
Basic K1S Block
Kinetics Modular Design

Component blocks - No Seal Between Blocks

Cartridge Heater Holes

Component ports

Gas path indication
Component Mounting
Modular Terms

- **Gas Stick** – A complete assembly of surface mounted modular substrates and components for ONE gas stream.
- **Active Components** - Any component which serves a function in the process such as valves, mass flow controllers, pressure regulators, flow switches, filters, etc.
- **Substrate (blocks)** – The modular building blocks which make up the gas delivery path for a gas stick.
- **Manifold Blocks** – Modular substrates which connect perpendicular to the gas stick flow. Allows combination of multiple gas lines and provides purge capability.
- **Bridges** – Floating substrates which allow the addition of components which are longer than a square footprint (i.e. mass flow controller).
K1S Gas Panel Example

- Pressure Transducer w/display
- Pressure Switch
- Inlet Fitting
- Pneumatic Valves
- Substrate
- Manifold
- Filter
- Mass Flow Controller
- Etched Flow Path
Bottom View - K1 System
K1S Stick Cut-Away

Flow Path:
K1S/K1 = 1/4” tubing equivalent
K1H = 3/8” tubing equivalent

GAS PATH