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IMPORTANT NOTICE:
The product data in this catalogue was obtained under specific test conditions that may vary substantially from actual site conditions and/or customer needs.
Each purchaser or user of Fujikin products must rely solely on its own system design engineers when selecting Fujikin products for a particular system, and when assessing the suitability of any system in which a Fujikin product is to be installed.

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FUJIKIN Water Vapor Generator

FINE series PURE VWG

Safety & Clean Technology

Fujikin Incorporated

Stainless Steel Forgings, Stainless Steel Castings, Brass Forgings, Steel Forgings, Alloys, Corrosion Resistant Material Forgings, Gun Metal/Alloy Products, Zircronium Products, Tantalum Products, Titanium Products, Fiberknob Products, Plastic Products, Fine Ceramic Products, Other Special Materials, New Metal and Material Products.

Valves—
- Various Types of Super Valves
- Various Types of Needle Valves (patent, X-6)
- Shock valve for extra high pressure
- QS valve (international patent, X-5 countries)
- Compact valves
- Various miniature valves
- Diaphragm type “MAX” control valves
- Ether still valves (patent, X-6)
- Various joints (patent)

Precision Machinery and Tools—
- Atomic valve unit, joints etc. (patent)
- Valve unit, joints etc. for the development of the universe (patent)
- Valve unit, joints etc. for the development of the ocean (patent)
- Valve unit, joints etc. for the development of the electronic machinery and tools (patent)
- Valve unit, joints etc. for the development of the related machinery and tools for medical treatment,

- Unit—Apparatuses—
- Full-Tec, seal-type automatic water (patent)
- Powder screw unit (patent)
- Air Tool R678, P678 (international patent)
- Every Drybolt (international patent)
- Easibrin®-based product (patent) (Sampling rock)
- Device for the collection of water in the can (Sampling rock)
- Chemical vapor dealing system
- Atomic calibration system
- Test for valves, joints
- Medical treatment appliances
- High pressure gas apparatus
- Air computer (patented)
- Airmatic® (hydraulic electronic control system)
- Controbin® (hydraulic automatic control system)

- Special Products—
- Designing and manufacturing of Special Valves, Cocks, Joints, etc.
- Overseas Tie-up Products—
- UNITECH Hand Struck Guns (technical Survey products with West Germany)
- BAKIMAT automatic shrink wrapping machine (technical Survey products with West Germany)
- Positioner (technical Survey products with U.S.A.)
- High-grade technical pressure apparatus (technical Survey products with West Germany)
- LESO/LF3000 pneumatically operated (technical Survey products with France)
- Glass fiber oil valves (technical Survey products with the U.S.A.)

- Products and Services—
- Generalizing components
- General service

CAT NO. T2001-001 A
2000 A & JV TV DD
WVG

In 1995, Fujikin succeeded in developing a device that produces ultra-high purity water vapor by means of a catalytic reaction - a radically different means than conventional pyrogenic water vapor generators.

Since then we have continued to gather data, perform exhaustive durability tests, and continually improved upon our process to create the present Water Vapor Generator (WVG).

The WVG catalytic reaction allows water vapor to be generated at a much lower temperature than is possible with conventional pyrogenic systems, and provides both high levels of safety and contamination-free output.

Now with an expanded range of flow control, the WVG may be used in a wide variety of processes.

Fujikin’s Flow Control System has the WVG at its Core

The Fujikin WVG:
The Consistent Leader in Flow Control Technology
Water Vapor Generator

In recent years, ULSI device production technology has advanced in two major directions: miniaturization and increase in wafer diameter. However, the demand for device reliability continues to increase. Fujikin has developed a new water vapor generating system that generates water vapor through a catalytic reaction of \( \text{O}_2 \) and \( \text{H}_2 \) for wet oxidation processes where reliability is especially required.

Catalytic Reactor

The Fujikin WVG supplies \( \text{H}_2 \) and \( \text{O}_2 \) into a reactor that uses a catalyst to produce water vapor. This makes it possible to produce water vapor at a lower temperature (350 °C / 662 °F) than is possible with conventional systems.

Wide Concentration Control Range

The WVG can control the water vapor concentration within a range of 1% to 100% - a range that is not possible to achieve with conventional pyrogenic water vapor generators. The concentration is controlled within high degree of accuracy according to the ratio of \( \text{H}_2 \) and \( \text{O}_2 \) supplied.

Superior Safety

The process of generating water vapor through a catalytic reaction is possible at 350 °C. This temperature is under the ignition boundary of hydrogen gas in an oxygen atmosphere at an atmospheric pressure of 760 Torr. Additionally, by means of an in-line gas sensor located downstream of the reactor, an alarm and warning signal will sound should the unreacted gas concentration increase above a pre-set level.

Multiple Interlocks

The WVG is equipped with a multitude of warning signals. If a problem should occur, the device will issue a warning signal and will automatically discontinue power to the WVG reactor heater.

Safety Specifications

SEMI-S2 Compliant, CE Marking
Control of Ultra-Thin Oxidation Films (Oxygen-Rich Type)

With the Fujikin WVG, hydrogen flow may start as soon as 5 seconds after initial oxygen flow. As soon as hydrogen is supplied, the reaction process begins immediately yielding instant water vapor. The amount of water vapor generated is based upon the control range of the MFC supplying the individual gases. Thus, ultra-low levels or large amounts of water vapor are possible.

Water Vapor Generation Conditions

Since water vapor may be generated in either oxygen rich or hydrogen rich atmospheres, the system may be utilized in new processes such as selective oxidation.

Pressure Conditions

The required pressure for reaction is atmospheric (0.2 MPa / 30 psi or less). Low-pressure or high-pressure models are optionally available.

Contamination-Free

Since water vapor is generated by means of a catalytic reaction, contaminants are not present or created. Furthermore, all piping within the WVG is stainless steel 316L with Fujikin UPG fittings. Therefore, consistent, ultra-high purity water vapor is assured.

Applications

The Fujikin WVG may be utilized in various process applications such as in diffusion equipment, RTP equipment, etc., which are all heat-processing systems.

SPECIFICATIONS (STANDARD MODELS)

Flow Range

<table>
<thead>
<tr>
<th>Reaction Type</th>
<th>Hi Flow Rate (scem)</th>
<th>Co Flow Rate (scem)</th>
<th>Hi/Co Flow Rate Ratio</th>
<th>Reactor Secondary Flow Rate</th>
<th>Dilution Line Flow Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2O+O2:O2 (O2 Rich)</td>
<td>2000 or less</td>
<td>600—2000</td>
<td>10% (1.07) or less</td>
<td>5SLM or less</td>
<td>As Required (20 SLM or less)</td>
</tr>
<tr>
<td>H2O+O2:O2 (Hi Rich)</td>
<td>600—4000</td>
<td>1000 or less</td>
<td>12% (2.4) or more</td>
<td>5SLM or less</td>
<td>As Required (20 SLM or less)</td>
</tr>
</tbody>
</table>

SSLM Model

<table>
<thead>
<tr>
<th>Reaction Type</th>
<th>Hi Flow Rate (scem)</th>
<th>Co Flow Rate (scem)</th>
<th>Hi/Co Flow Rate Ratio</th>
<th>Reactor Secondary Flow Rate</th>
<th>Dilution Line Flow Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2O+O2:O2 (O2 Rich)</td>
<td>5000Btu</td>
<td>600—5000</td>
<td>10% (1.07) or less</td>
<td>10SLM or less</td>
<td>As Required (20 SLM or less)</td>
</tr>
<tr>
<td>H2O+O2:O2 (Hi Rich)</td>
<td>600—7500</td>
<td>2500 or less</td>
<td>12% (2.4) or more</td>
<td>10SLM or less</td>
<td>As Required (20 SLM or less)</td>
</tr>
</tbody>
</table>

Temperature Control Range

<table>
<thead>
<tr>
<th>Controller Number</th>
<th>Heater Installation Position</th>
<th>Set Point (°C)</th>
<th>Normal Range (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTC 1</td>
<td>Reactor Outlet (HTC1)</td>
<td>350</td>
<td>±50</td>
</tr>
<tr>
<td>HTC 2</td>
<td>Dilution Gas Delivery Piping (HTC2)</td>
<td>140</td>
<td>±30</td>
</tr>
<tr>
<td>HTC 3</td>
<td>Reactor Outlet Piping, Gas Sensor, Filter, Outlet Piping (HTC3)</td>
<td>140</td>
<td>±30</td>
</tr>
<tr>
<td>HTM</td>
<td>Reactor Surface (Outlet Side)</td>
<td>Temperature Monitor HTM for Operational Error Prevention</td>
<td>350</td>
</tr>
</tbody>
</table>

Connections

<table>
<thead>
<tr>
<th>Port</th>
<th>Connection Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAS IN (Hi+O2)</td>
<td>1/4&quot; UJR MALE</td>
</tr>
<tr>
<td>GAS IN (Dilution Gas)</td>
<td>1/4&quot; UJR FEMALE</td>
</tr>
<tr>
<td>GAS OUT (HiO + Excess Gas)</td>
<td>1/4&quot; UJR MALE</td>
</tr>
</tbody>
</table>

Piping

<table>
<thead>
<tr>
<th>Design Pressure</th>
<th>Material</th>
<th>End-Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2 MPa</td>
<td>SUS 316L</td>
<td>Metal Gasket Fittings (UJR, UPG)</td>
</tr>
</tbody>
</table>

Power Supply and Consumption

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>Consumption</th>
<th>Rate 15kW or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>100—110 VAC, 50/60Hz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>