Applications / Notifications (for the Domestic Use in Japan)

By Establishment of this Equipment, you need to submit applications / notifications to the Prefecture. We support by creating the forms.

- High Pressure Gas Production Notification
- High Pressure Gas Production Facilities Change Notification
- Class 2 Storage Place Establishment Notification
- Class 2 Storage Place Position Change Notification

This Equipment is developed by AIST (National Institute of Advanced Industrial Science and Technology) and Meidensha.

Contact Information

Engineering Business Unit, Pure Ozone Generator Business Development Division

TEL. (03)3490-4279
FAX. (03)3490-7855

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www.meidensha.com

Continuous supply for high purity ozone gas
Features

- Ozone gas generated in an ozonizer, is cooled in cryogenic refrigerators, and high-purity liquid ozone by separation and accumulation in an ozone chamber.
- This system enables continuous supply of the high purity ozone gas by evaporation of the liquid ozone.

Safety measurement

- Always keep the system safe by operating under the condition of high purity and low pressure.

**Safe Design**
- Explosion-proof Design
- Temperature/pressure control with the fail safe system by power supply.

**Reliability**
- Has an emergency purge mechanism to dilute ozone in the process gas line and discharge residual ozone within the apparatus in times of power outage.
- Can be switched of manually by an EMO(emergency off) switch in the event of any anomaly (chiller has an operation maintenance function to prevent ozone explosion).
- Even in the unlikely event of an explosion, the structure is designed to prevent any mechanical damage to external equipment by having the liquefaction chamber housed within a vacuum-insulated stainless steel container.
- The liquid ozone cooling unit has sufficient heat volume for the amount of accumulated liquid ozone so as to reduce the risk of rapid vaporization due to vibration, which otherwise is a risk factor for explosion.

**Standards Certification**
- The unit is conformed to international standards: SEMI-S2, UL, NFPA, CE etc.

**Quality Assurance**
- Safety against gas leakage is verified by tracer gas test of a third-party certifier.

Application

**Environment**
- Water treatment
- Pure ozone processing
- Sterilization, deodorization
- Carbon fiber decomposition

**Medicine**
- New drug manufacturing (Biotech)
- Pure ozone processing
- Organic synthesis

**Film**
- Organic film
- Low-temperature deposition
- Pure ozone - ethylene
- Low-temperature thin film, barrier properties
- Removal, adhesion, thin film
- Sterilization, barrier properties
- Barrier properties

**Materials**
- Electrode components
- Pure ozone - ethylene
- Oxide film, surface modification
- Carbon nanotubes
- Removal

**Semiconductor**
- Mask manufacturing process
- Pure ozone processing
- Pure ozone - ethylene
- Removal
- Oxide film, removal

**High-technology**
- Molecular beam epitaxy (MBE)
- Pure ozone processing
- Pure oxide source
- Cleaning, surface modification

**OER* Process technology**

*OER: Ozone-Ethylene Radical generation technology

Through our elaborate R&D activity, We succeeded in generating OH radicals and transporting them efficiently on any processed substrate by mixing highly concentrated ozone and ethylene with each partial pressure precisely controlled.
Formation of high quality metal oxide thin films can be formed by using pure ozone (high purity ozone) gas as oxygen source.

Superiority of using pure ozone (high purity ozone) as oxygen source has been beginning to introduced in the international market.

Example

Growth of high quality metal oxide thin films

The example of the oxygen source for MBE (Molecular Beam Epitaxy)

Results:
- Formation of high quality metal oxide thin films can be formed by using pure ozone (high purity ozone) gas as oxygen source.
- Superiority of using pure ozone (high purity ozone) as oxygen source has been beginning to introduced in the international market.

In-situ cleaning

The example of in-situ cleaning process after EUV lithography

Results:
- Low pressure & highly-reactive source makes in-situ real-time (24/7) cleaning possible.
- A feat which low concentration O3 never achieved.
- Just removing C contamination without growing oxidation layer and keeping reflectivity of the beam.
- No mask and mirror damages since high purity ozone without NOx & H2O free O3.
- Even in ultra-high vacuum (UHV) chamber, preserves sufficient ozone molecular weight to dispose contamination for 100% concentration ozone.

Surface modification

The example of the surface hydrophilization of carbon fiber

Results:
- Hydrophilic termination into whole surface of the fiber
- More than 1 month duration of the termination
- No thermal and physical damages confirmed
Device configuration (Continuous supply type)

**Air source**
- Panel Air compressor: Max. 1.5 HP, 105 CFM
- Flow rate: More than 9 L/min
- Pressure: 40 - 60 PSI

**Water source**
- Corrosion Resistant Water Chiller: Pressure: 110 - 120 PSI
- Flow rate: More than 12 L/min
- Temperature: 30 ± 5 °C

**Specification**

<table>
<thead>
<tr>
<th>Type</th>
<th>Batch type (Standard)</th>
<th>Continuous supply type</th>
<th>Continuous supply type \ (Auto-flushing function available)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit configuration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Accumulation part</strong></td>
<td>Number of Ozone Chamber</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>8000/unit</td>
<td>16000/unit</td>
<td>24000/unit</td>
</tr>
<tr>
<td>2</td>
<td>16000/unit</td>
<td>32000/unit</td>
<td></td>
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<tr>
<td>3</td>
<td>24000/unit</td>
<td>48000/unit</td>
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</tr>
<tr>
<td><strong>Supply part</strong></td>
<td>Maximum Ozone accumulation volume*¹ [cc]</td>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>8000/chamber</td>
<td>16000/chamber</td>
<td>24000/chamber</td>
</tr>
<tr>
<td>2</td>
<td>16000/chamber</td>
<td>32000/chamber</td>
<td>48000/chamber</td>
</tr>
<tr>
<td><strong>Liquid Ozone Concentration [%]</strong></td>
<td>≈ 100</td>
<td>≈ 100</td>
<td>≈ 100</td>
</tr>
<tr>
<td><strong>Continuous Supply Rate [sccm]</strong></td>
<td>x</td>
<td>x</td>
<td>100*²</td>
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<tr>
<td><strong>Maximum Supply Rate [sccm]</strong></td>
<td>100</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td><strong>Ozone Gas Concentration [%]</strong></td>
<td>More than 90</td>
<td>More than 90</td>
<td>More than 90</td>
</tr>
<tr>
<td>**Maximum supply time [min]**³</td>
<td>80</td>
<td>50</td>
<td>100</td>
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<tr>
<td><strong>Safety</strong></td>
<td>Conformable</td>
<td>Conformable</td>
<td>Conformable</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>Negative Pressure Control*⁵</td>
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<td>x</td>
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<tr>
<td>**Emergency purge mechanism*⁶</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>**Auto-flushing Function*⁷</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>**Out of Operation*⁸</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

**Dimensions (Except for projection part [Unit: mm])**

- **Batch type**
  - Mass: 490 kg
  - Mass: 470 kg
  - Mass: 230 kg

- **Continuous supply type**
  - Mass: 490 kg
  - Mass: 470 kg
  - Mass: 230 kg

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*1: Volume in standard state condition (0℃, 1 atm).
*2: Time for maximum supply rate.
*3: 'Generation of ozone gas permitted only when the enclosure pressure is negative to atmospheric pressure.
*4: 'Sored liquid ozone pumped out when the system is not normal.
*5: 'Automatically remove the impurities accumulated in the ozone chamber during continuous operation.
*6: 'Flush operation of ozone chamber will be carried out only when the device is stopped.
*7: 'Flush operation of ozone chamber will be carried out while the device is in operation.
*8: 'If flushing operation of ozone chamber is not carried out, the device is not operational.

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5 6
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