i-Flow O2 Gas Generators
Product Training
PEAK Gas Generation – 02
i-Flow O2
Oxygen Gas generator

- **Oxygen gas, on-demand** – 6 models, capable of supplying up to 480 L/min, at purities ranging from 90 – 94%
- **Modular expandability** - future-proof design, allows columns & generator units to be added as business needs grows
- **Cost effective** - Cost effective & reliable industrial grade oxygen, available on-demand
- **Verified Purity** - Independently verified oxygen purity (via the National Physical Laboratory)
- **Quality guaranteed** - Quality guaranteed with built-in PurityGuard™ gas monitoring & application safeguard system
- **Energy Efficient** - Energy efficient with built in standby mode, ensuring the lowest running costs
- **Safer supply** - On-site safety, eliminate the risks of high-pressured gas cylinders or cryogenic liquid storage tanks
- **Eco-friendly** - Lower carbon footprint & environmentally friendly
### i-Flow O2 8000 Series: Capability & Performance

<table>
<thead>
<tr>
<th>Model</th>
<th>801X</th>
<th>802X</th>
<th>803X</th>
<th>804X</th>
<th>805X</th>
<th>806X</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>O2 Purity</strong></td>
<td><strong>Flow Rate (L/min)</strong></td>
<td>94%</td>
<td>70</td>
<td>140</td>
<td>200</td>
<td>260</td>
</tr>
<tr>
<td>93%</td>
<td>80</td>
<td>160</td>
<td>230</td>
<td>310</td>
<td>375</td>
<td>440</td>
</tr>
<tr>
<td>90%</td>
<td>90</td>
<td>180</td>
<td>240</td>
<td>320</td>
<td>400</td>
<td>480</td>
</tr>
<tr>
<td><strong>Max. Pressure</strong></td>
<td>5 bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**NOTE:**
Performance Data is based on standard requirement of 7 bar inlet pressure.

Inlet temperature assumed & 20-25 degrees C
i-Flow Gas Generators: Future-Proof, Modular Design

**Expandable:**
Additional column banks can be added on-site to any unit retrospectively as demand grows

**Scalable:**
i-Flow’s modular design also allows for several units to be synchronized together to further scale up output capacity
Product Overview: Technology
i-Flow N2 & O2 gas generators use a process called **Pressure Swing Adsorption** (PSA), which utilises a **Molecular Sieve** (N2=Carbon, O2=Zeolite). Under cyclical pressurisation, the molecular sieves preferentially adsorb gases, allowing the product gas (N2 or O2) to pass downstream, as adsorbed gases are vented safely to atmosphere.
i-Flow O2 8000 series oxygen generator

i-Flow O2 is a modular & expandable Pressure Swing Adsorption oxygen gas generator, utilizing synthetic zeolite molecular sieve purification technology to supply high quality, industrial grade oxygen, at up to 480 L/min, at up to 5 bar pressure and a consistent purity.

Oxygen generation using PSA

1. Filtration
2. Control Valves
3. Synthetic Zeolite
4. Oxygen output for use Nitrogen Oxygen
Consistent, efficient & robust:

- High quality grade CMS / ZMS – lifespan 10 to 20 years!!
- ‘Snowstorm filling’ technique allows for a greater quantity of pellets to be compacted into the bed (approx. 16 – 18% more)
  - Prevents ‘channelling’ - ensures consistent performance & purity
  - Prevents abrasive breakdown due to cyclical pressurisation / depressurisation
Snowstorm Filling
Product Overview: Typical Set-up
Installation

Minimum Air Quality
ISO 8573-1:2010 class 1.4.1

Minimum Inlet Air Pressure 87 psi (6bar)
Maximum Inlet Air Pressure 145 psi (10bar)
Minimum Inlet Air Temperature +5°C (41°F)
Maximum Inlet Air Temperature +35°C (95°F)
<table>
<thead>
<tr>
<th>Class</th>
<th>Particles By Particle Size</th>
<th>Particles By Mass</th>
<th>Water Vapor Pressure Dewpoint</th>
<th>Water Liquid</th>
<th>Oil Liquid, Aerosol, &amp; Vapor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(max. number of particles per m³)</td>
<td>mg/m³</td>
<td>°C</td>
<td>°F</td>
<td>g/m³</td>
</tr>
<tr>
<td>0</td>
<td>As specified by user or supplier and more stringent than class 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>≤ 20,000</td>
<td>≤ 400</td>
<td>≤ 10</td>
<td>-</td>
<td>≤ -70</td>
</tr>
<tr>
<td>2</td>
<td>≤ 400,000</td>
<td>≤ 6,000</td>
<td>≤ 100</td>
<td>-</td>
<td>≤ -40</td>
</tr>
<tr>
<td>3</td>
<td>≤ 90,000</td>
<td>≤ 90,000</td>
<td>≤ 1,000</td>
<td>-</td>
<td>≤ -20</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>≤ 90,000</td>
<td>≤ 1,000</td>
<td>-</td>
<td>≤ -20</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
<td>≤ 10,000</td>
<td>-</td>
<td>≤ -20</td>
</tr>
<tr>
<td>6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0 - ≤ 5</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5 - ≤ 10</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>≤ +10</td>
</tr>
<tr>
<td>9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>≤ +10</td>
</tr>
<tr>
<td>X</td>
<td>-</td>
<td>-</td>
<td>&gt; 10</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Microbiological Contaminants**

No purity classes are identified

**Other Gaseous Contaminants**

Gases mentioned are: CO, CO₂, SO₂, NOX, Hydrocarbons in the range of C₁ to C₅
Product Overview: Safety
Although input and output pressures may not differ greatly from most of our Scientific range, it is the flows involved in the industrial process that add greater risk to safety.

At many points in the system there can potentially be thousands of L/pm at any given time, therefore ensuring we are operating safely becomes even more critical.
How do we achieve safety?

Training
Building on prior knowledge and experience to have a greater understanding of how the system works and how to remain safe.

PPE
Meeting the minimum required standard to ensure we remain protected at all times.

Points of Isolation
Know of all the points of isolation throughout the system, both electrical and pneumatic. This allows us to correctly isolate areas we are working on.

Awareness/Procedures
Being aware of the dangers around us and adhering to approved procedures, as well as referring to service manuals can help keep us safe.
Product Overview: Why is Maintenance Important
Front face of generator
The service LED will indicate when the annual service is due.

Once illuminated the generator will continue to function as normal but should not be operated for prolonged periods of time without carrying out the required maintenance.
Why Maintenance is Important

➢ N2 and O2 Service
➢ Skidded Solution
Always ensure the system is isolated/dissipated correctly and safe to work on

Always follow the safe isolation procedure, if you are unsure…
Due to the simplicity of the design and the small number of moving parts the Industrial i-Flow Series O2 & Nitrogen Generators will have a long and trouble-free life. However as with all scientific and technical equipment it should be regularly inspected and serviced as below.

<table>
<thead>
<tr>
<th>Service Interval</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 months</td>
<td>Vent Silencer Element</td>
</tr>
<tr>
<td></td>
<td>Pneumatic Valve Exhaust Silencer</td>
</tr>
<tr>
<td></td>
<td>N₂ Supply NRV</td>
</tr>
<tr>
<td>24 months</td>
<td>O₂ Analyser % (#)</td>
</tr>
<tr>
<td>48 months</td>
<td>O₂ Analyser PPM (#)</td>
</tr>
</tbody>
</table>

Note # - Analyser service is dependent on s
The Pressure Swing Adsorption Cycle is crucial to the performance of the generator & maintaining the purity of gas produced.

Carried out annually

Located inside the generator.

As we vent high volumes of N2 from the generator the silencers are there to reduce the noise.

Reason for changing annually.
Any blockage in the silencer will slow down the venting process this will have a direct affect the purity of the O2
Pneumatic Valve Exhaust Silencer

Changed Annually
Timings are critical to the operation of the PSA system even a delay of seconds due to any blockage will affect the purity.
The NRV’s prevent back flow of the produced O2 gas to the offline column during the vent process. These are changed annually as the seal can degrade over time.
O2 analysers are customer selected options, it may be that you have selected not to fit an analyser as gas quality is not critical to your operation.
Troubleshooting
The generator only makes up one part of a much larger system!
A good starting point for any faults compressor side is to check it has been serviced in accordance with recommendations!

A very common fault is a trip on High Temperature. This is normally due to a low oil level/fault with the oil system (again, leading us back to servicing) but can also be caused by running at max capacity for sustained periods of time due to leaks or the generator requiring too much air (incorrect set up – check generator settings)
Dryer Faults

Like the compressor, always check dryers have been regularly serviced correctly!

If installed in a poorly ventilated room the dryer may also trip on high temperature. Also if the filters/auto drain develop a fault or block due to not being serviced, they may create a large pressure drop in the system which will choke the downstream appliances (our generators)
Contamination Due to Air Filtration Failure

PSA gas generators require a certain quality of air which must be maintained with regard to Particle, Water and Oils (Air compressor condensate) otherwise the column media (Zeolite) will become contaminated and lose performance with no chance of recovery.

We have filters both inside the generator and on the input side to ensure the correct air quality is met prior to reaching the PSA system. Check the condition of filter elements in the event of system contamination.
1. Check Valve line-up correct (vent/drain valves shut, system isolation valves open)

2. Check that all inlet filters have been serviced correctly and filter elements and auto-drains are not blocked/full

3. Check all inlet air pipework fittings and components are leak free and securely fastened

4. Check Inlet air vent valve before generator inlet is securely closed.

5. Check i-Flow inlet pressure regulator has been set correctly as detailed on test sheet

6. Check inlet Flow control Orifice not blocked
Outlet Pressure and Flow not correct

1. Correct Flow using generator outlet flow controller to flow stated on test sheet

2. Correct Pressure using generator outlet pressure controller to pressure stated on test sheet

3. Check input pressure is correct with test sheet

4. Check for system leaks on generator and outlet pipework fittings/valves

5. Close off outlet and check generator enters ‘Eco Mode’, once in Eco Mode process tank pressure should stabilize, if not replace Non-return valves.
Purity Not Correct Or Spiking Rapidly

1. Has generator had enough time to reach purity from startup (24 hours)
2. Check Oxygen sensor and analyzer are within calibration date (certificate inside generator)
3. Check analyzer and PLC have the same reading
4. Check system for leaks
5. Check flows and pressures are correct
6. Check that reduction valve for analyzer sensor is set around 4 bar
7. Check SMC Solenoid valves are securely attached to manifold on Electrical panel (2 very small screws on each solenoid valve may require tightening)
8. Check Carbon tower ‘Saturation’ gauge at bottom of carbon tower, if high/top level replace carbon
Thank you

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• **Restless** constantly striving to improve
• **Freedom with responsibility**
• **Fun & passion** in everything we do

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