CORNING
Pharmaceutical Glass Tubing
Corning Incorporated owns two pharmaceutical glass tubing subsidiaries: Corning Pharmaceutical Glass, LLC in Vineland, NJ (USA) and Corning Pharmaceutical Glass S.p.A. in Pisa, Italy. With over 160 years of experience in specialty glass and materials science innovation, Corning Pharmaceutical Glass is uniquely suited to supply high-quality clear and amber borosilicate glass tubing for pharmaceutical primary packaging.

- Two tubing production sites
- Clear and amber glass tubing
- Glass type I USP / EP / JP
- Expansion coefficient 33 and 51
- Diameters: 4 – 150 mm
- Wall weights: 0.18 – 8.00 mm
- Lengths: 1,050 – 3,500 mm
Glass Composition

& Chemical Resistance Classification

**Glass Composition (approximate oxide weight [%])**

<table>
<thead>
<tr>
<th>Oxide Component</th>
<th>Symbol</th>
<th>Corning® 51-V</th>
<th>Corning® 51-D (*)</th>
<th>Corning® 51-L (Amber)</th>
<th>Corning® 33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon Dioxide</td>
<td>SiO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>72.0</td>
<td>73.0</td>
<td>69.0</td>
<td>80.0</td>
</tr>
<tr>
<td>Boron Oxide</td>
<td>B&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;3&lt;/sub&gt;</td>
<td>11.5</td>
<td>11.2</td>
<td>10.0</td>
<td>12.7</td>
</tr>
<tr>
<td>Aluminium Oxide</td>
<td>Al&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;3&lt;/sub&gt;</td>
<td>6.8</td>
<td>6.8</td>
<td>6.0</td>
<td>2.6</td>
</tr>
<tr>
<td>Calcium &amp; Magnesium Oxide</td>
<td>CaO + MgO</td>
<td>0.7</td>
<td>1.0</td>
<td>1.0</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Sodium Oxide</td>
<td>Na&lt;sub&gt;2&lt;/sub&gt;O</td>
<td>6.5</td>
<td>6.8</td>
<td>6.0</td>
<td>4.3</td>
</tr>
<tr>
<td>Potassium Oxide</td>
<td>K&lt;sub&gt;2&lt;/sub&gt;O</td>
<td>2.4</td>
<td>1.2</td>
<td>2.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Iron Oxide</td>
<td>Fe&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;3&lt;/sub&gt;</td>
<td>&lt; 600 ppm (**)</td>
<td>&lt; 400 ppm (**)</td>
<td>1.0</td>
<td>&lt; 500 ppm (**)</td>
</tr>
<tr>
<td>Barium Oxide</td>
<td>BaO</td>
<td>&lt; 400 ppm (**)</td>
<td>&lt; 400 ppm (**)</td>
<td>1.5</td>
<td>&lt; 400 ppm (**)</td>
</tr>
<tr>
<td>Titanium Dioxide</td>
<td>TiO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>&lt; 400 ppm (**)</td>
<td>&lt; 300 ppm (**)</td>
<td>3.0</td>
<td>&lt; 400 ppm (**)</td>
</tr>
</tbody>
</table>

(*) Formulated for closed ampoules / (**) Not introduced in the batch composition

**Chemical Resistance Classification**

<table>
<thead>
<tr>
<th>Resistance Class</th>
<th>Specification</th>
<th>Corning® 51-V</th>
<th>Corning® 51-D</th>
<th>Corning® 51-L</th>
<th>Corning® 33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrolytic Resistance (Glass Grain)</td>
<td>EP (3.2.1B) / USP &lt;660&gt;</td>
<td>Type I</td>
<td>Type I</td>
<td>Type I</td>
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<tr>
<td>Hydrolytic Resistance (Glass Grain)</td>
<td>ISO 720</td>
<td>HGA1</td>
<td>HGA1</td>
<td>HGA1</td>
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<tr>
<td>Soluble Alkali Test</td>
<td>JP 7.01</td>
<td>Complies</td>
<td>Complies</td>
<td>Complies</td>
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<tr>
<td>Acid Resistance Class</td>
<td>DIN 12116</td>
<td>Class S1</td>
<td>Class S1</td>
<td>Class S1</td>
<td>Class S1</td>
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<tr>
<td>Alkali Resistance Class</td>
<td>ISO 695</td>
<td>Class A2</td>
<td>Class A2</td>
<td>Class A2</td>
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<tr>
<td>ASTM Laboratory Glass Class</td>
<td>ASTM E 438</td>
<td>Class B</td>
<td>—</td>
<td>—</td>
<td>Class A</td>
</tr>
</tbody>
</table>
Fully Controlled & Automated Production Process

From raw material preparation to final packaging, tubing production is seamlessly integrated. Innovative process control monitors the entire production flow through built-in feedback loops and dedicated in-line and in-process inspections.

- Raw material / laboratory
- Melting
- Forming
- In-process inspection
- Packaging
- Traceability

Traceable to a Single Bundle

Labeling allows for complete traceability down to a single, specific bundle.
1. Cosmetic inspection system
   - 100% cosmetic inspection on all lines with automated reject
   - Camera and laser inspection
   - Circular coverage: 100%
   - Defect types: airlines, knots & stones

2. Dimensional inspection for OD/ID
   - 100% inspection on all lines with automated reject
   - Laser inspection for OD
   - Camera inspection for ID

3. Dimensional inspection for WT
   - 100% inspection with automated reject
   - One to four axes thickness measurement
   - Wall-siding measurement
   - More than 40 points measured per tube

4. SPC
   - IPC by shift quality inspectors
   - Final acceptance by QC
   - Cp / Cpk monitoring
Finishing & Packaging

1. Active particle prevention and removal
   - Sharper and cleaner cut by H₂ burners
   - Antistatic blow with ionized air
   - Optimization of blow nozzle shape and parameters by CFD analysis

2. Tubing end finishing inspection
   - Defect types: end cracks, cosmetic defects
   - Inspection also for square cut and glaze ID
   - Circular coverage: 100%

3. Fully automated packaging station
   - Tubes are automatically stacked in single packs
   - Compact bundles are formed using plastic shrink film
   - Bundle labelling assures traceability
   - Staggered bundle configuration reduces scratches
About Corning

Corning is one of the world’s leading innovators in materials science. For more than 160 years, Corning has applied its unparalleled expertise in specialty glass, ceramics, and optical physics to develop products that have created new industries and transformed people’s lives. Corning succeeds through sustained investment in R&D, a unique combination of material and process innovation, and close collaboration with customers to solve tough technology challenges.

Europe
Corning Pharmaceutical Glass S.p.A.
Via Montelungo, 4
56122 Pisa, Italy

Phone: +39 050 56 66 11
E-mail: cpginfoeu@corning.com

North America
Corning Pharmaceutical Glass, LLC
563 Crystal Avenue
Vineland, NJ 08360-3257 USA

Phone: +1 856 794 7100
E-mail: cpginfousa@corning.com