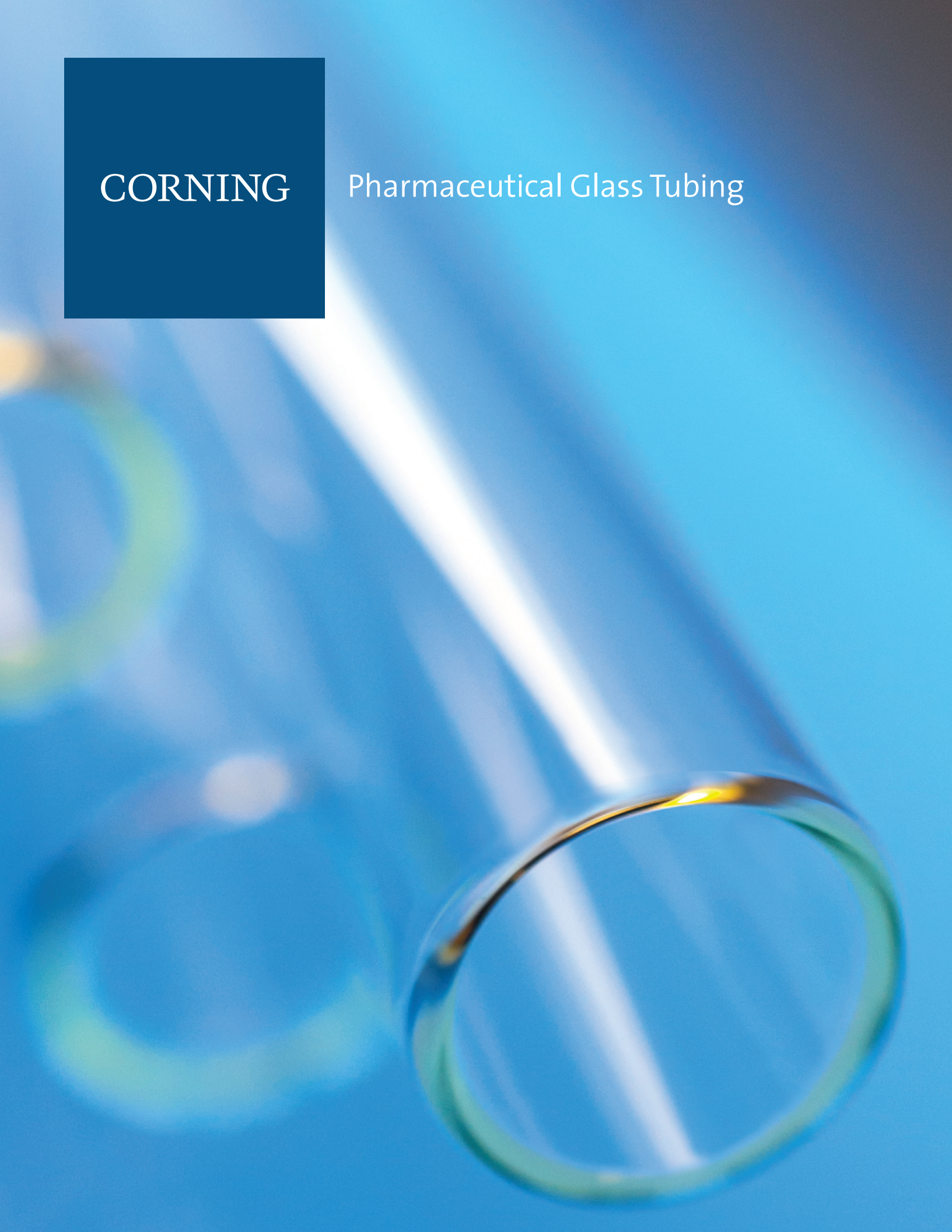
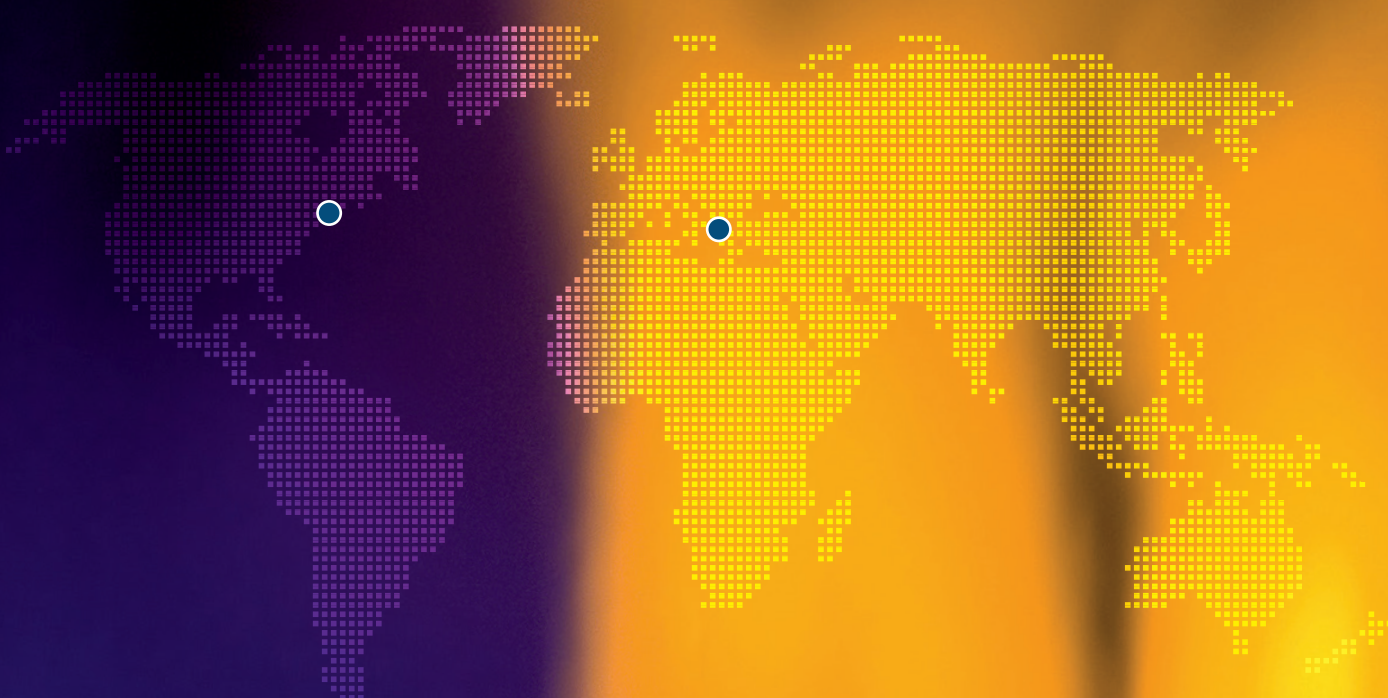


CORNING

Pharmaceutical Glass Tubing

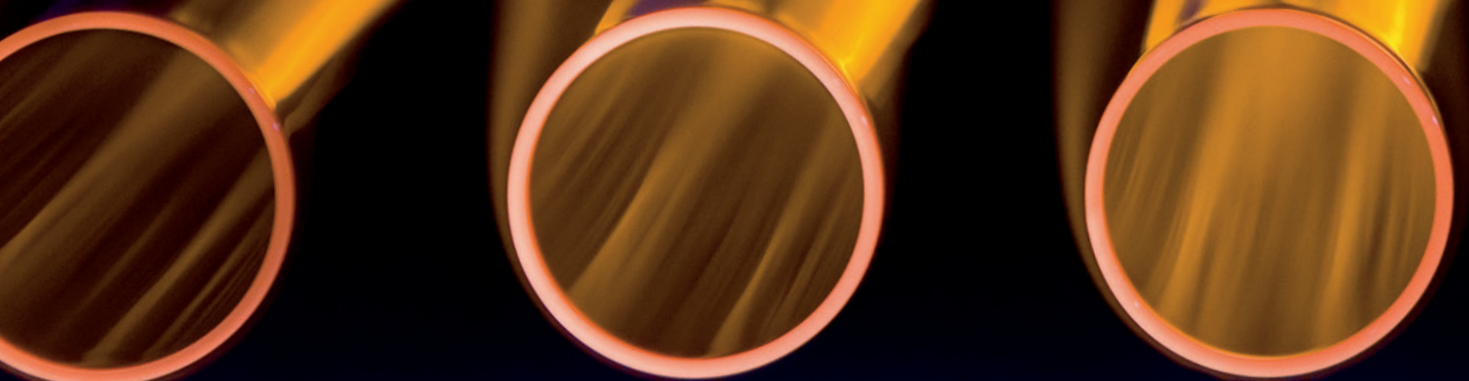




Production Sites to Serve Our Global Customers

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 [%])

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

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

Chemical Resistance Classification

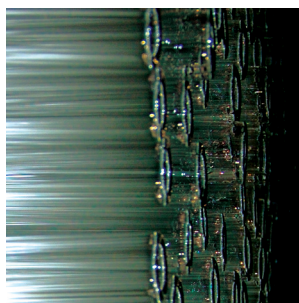
Resistance Class	Specification	Corning® 51-V	Corning® 51-D	Corning® 51-L	Corning® 33
Hydrolytic Resistance (Glass Grain)	EP (3.2.1B) / USP <660>	Type I	Type I	Type I	Type I
Hydrolytic Resistance (Glass Grain)	ISO 720	HGA1	HGA1	HGA1	HGA1
Soluble Alkali Test	JP 7.01	Complies	Complies	Complies	Complies
Acid Resistance Class	DIN 12116	Class S1	Class S1	Class S1	Class S1
Alkali Resistance Class	ISO 695	Class A2	Class A2	Class A2	Class A2
ASTM Laboratory Glass Class	ASTM E 438	Class B	—	—	Class A

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.

In-line Quality Inspection



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

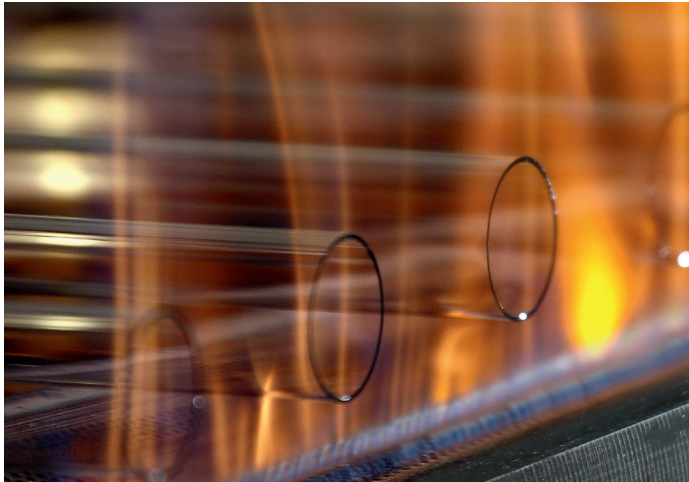
3. Dimensional inspection for WT

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

4. SPC

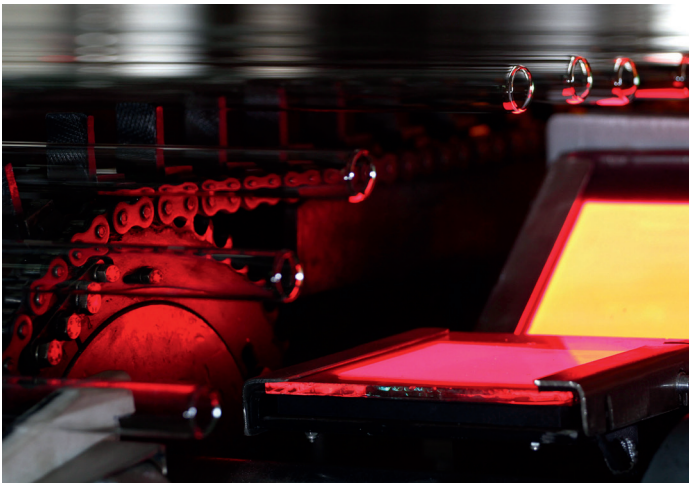
- IPC by shift quality inspectors
- Final acceptance by QC
- Cp/Cpk monitoring

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.

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