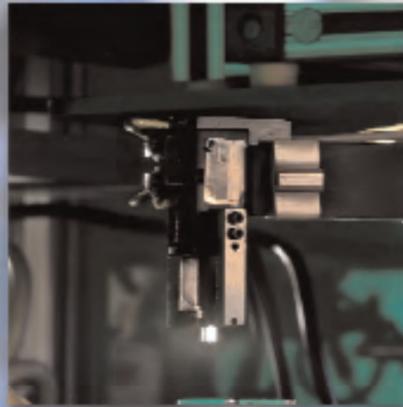




ACCU-GLASS LLC

Accu-Glass™ Products
*Glass Tubing Experts &
Microbore Technology*

Accu-Glass is renowned for innovative and problem-solving solutions serving medical products and many other industries. Superior quality is the "ground floor" of our organization. Upon it, we continually strive to develop, manufacture and supply advanced products and services. We are committed to the highest standards of excellence in everything we do.



Where Art & Science Come Together.

Accu-Glass

Since 1960, Accu-Glass has been dedicated exclusively to the engineering and manufacturing of precision glass tube products. Our numerous clients in the medical, laboratory, Point-of-Care, fiber optic and electronic component industries have come to rely upon Accu-Glass as a trusted resource. Commitment to quality engineering and service is our strength.

The staff of Accu-Glass engineers is ready to assist you in the design and development of your glass applications.



Since 1960, our commitment has continuously provided worldwide solutions in the design, development and manufacturing of high-precision, microbore, specialized glass tubing. Integrity, trust and confidence keep Accu-Glass at the forefront of our industry.



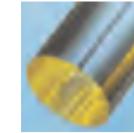
Flow Testing

Certain applications require very precise flow control of liquids or gases. Accu-Glass has developed a process to measure and sort flow-control components made of glass tubing. This technology can be applied on the drawing line to select tubing using SPC techniques, or the finished product can be 100% flow checked to ensure compliance with specifications. Typical flow control tolerances for airflow are $\pm 5\%$. We have the expertise to help you design your product through correlation studies of air versus liquid flow.

PRECISION

Quality Assurance: A Reputation for Excellence

Quality is the standard at Accu-Glass. Innovation and problem solving are encouraged from every associate at every level of production. Custom-designed systems are employed to provide precise dimensional measurements to meet the most demanding customer requirements. Some of the measuring systems include:



- Vision Technology
- Laser Technology
- Flow Testing Technology
- Volumetric Measuring Technology

Our drawing and manufacturing processes employ SPC software for online monitoring and process control. This allows quick reaction to any production issues and helps maintain quality control to ensure product and process conformance. Collected data is archived to document and retain product history.

As a premier manufacturer, flexibility has become our reputation and hallmark in the glass industry. We strive to meet your needs and production requirements.

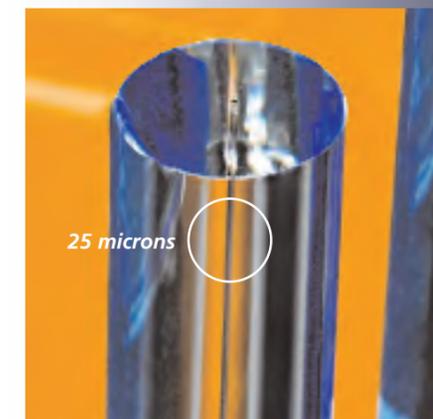
Accu-Glass is compliant to the Food and Drug Administration's Quality System Regulation (QSR) 21 CFR Part 820. The quality system at Accu-Glass is registered to ISO 9001:2000.

Glass – There Is No Substitute.

Glass is the only material that can offer precision, reliability and flexibility in manufacturing. It is a naturally inert material, so it won't react with other materials or chemicals. It is clean, clear and strong, but versatile and dimensionally stable. Glass is our raw material. Glass tubing is our only business.

From concept to finished product packaging, you will find that Accu-Glass is the leader in innovation. Our engineers work with you to develop a new product or enhance an existing product. We invite you to rely on our worldwide expertise in glass technology.

Accu-Glass has the technology and the capability to produce an inside diameter bore as small as 25 microns. In comparison, this is 3 times smaller than the average human hair.





At Accu-Glass, tubing and rods are formed by a unique Direct Draw process. The material is continuously "pulled" from a vessel of molten glass. The advantage of this process over conventional "tank drawn" or "redrawn" tubing is that a wide range of geometric shapes and precise tolerances are achieved.

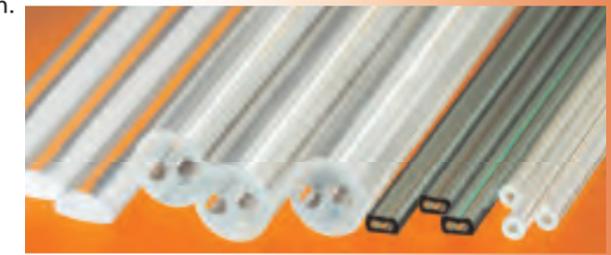
SPECIALIZED

Glass Forming Process/Types of Glass

The measurement methods applied at Accu-Glass provide extremely tight tolerances. These methods employ laser, optical, volumetric, and mass flow measurement technologies, depending on the product application. The process is controlled using SPC techniques and Windows-based software data collection is utilized to retain product history. AG is capable of producing OD's up to 6.00 mm with wall thicknesses as small as 7% of the nominal OD. Internal diameters can be as small as 25 microns with tolerances down to +/- 1 micron.

Additional advantages include:

- Lower volume runs
- Short turnaround times
- Broad array of shapes
- Identification striping
- Redraw capability



Borosilicate Glass

Borosilicate glass is a neutral glass product with high chemical resistance and is ideal for use in the medical and pharmaceutical industries (conforms to USP Type I and ASTM Type I, Class B). Uses include flow restrictors, fiber optic components, and electrical applications.



Physical Properties:

- Softening Point (10^{7.6} dPa*s) 785°C
- Expansion Coefficient (300°C) 55 (X10⁻⁷)/°C
- Density 2.33 g/cm³

Soda Lime Glass

This product is a pharmaceutical grade of soda lime glass used in the medical and pharmaceutical industries (conforms to USP Type III and ASTM Type II). Its wide range of uses includes capillary, hematocrit, blood measurement, volumetric, and micropipette tubes with various coatings and calibrated markings, as well as crushable ampoules.



Physical Properties:

- Softening Point (10^{7.6} dPa*s) 708°C
- Expansion Coefficient (300°C) 90 (X10⁻⁷)/°C
- Density 2.52 g/cm³

Inquire about glass materials that will not discolor after gamma and x-ray sterilization processes.

Specialty Formulations

Glass chemistries can be tailored to meet specific needs for a variety of applications and properties.

Electronic Glass/Barium— An infrared-absorbing sealing glass for use in reed switches and other electronic packaging applications.

Opal Glass— A fluoride opal glass available in white and blue, for use with higher expansion 90-95 (X10⁻⁷)/°C glasses. Other colors available upon request.



Accu-Glass™ Products

Microbore Flow Restrictors

Glass flow restrictors are utilized in many applications that require an exact flow rate.

- Ambulatory infusion pumps to ensure the patient receives proper medication flow.
- Others meter gases and control the flow of saline in flush devices used with disposable blood pressure transducers.

Microbore restrictors are formed from molten glass with precise inside diameters (ID) as small as 25 microns, with a tolerance of ± 1 micron. Tubing is then cut to a specific length, which can be identified by a formula that involves the ID and pressure to achieve the desired flow.



Capillary Tubing

Accu-Glass manufactures precision diameter, thin-walled glass tubing. By design, this produces capillary action, which is the movement of a liquid into a tube based on its surface tension. These precision tubes are used in liquid measurement, transfer and sample collection applications.

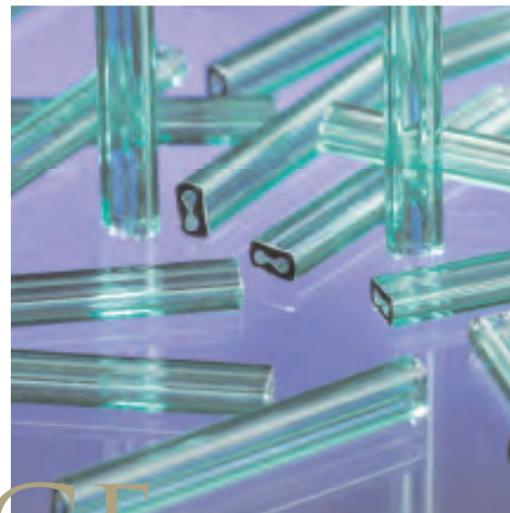
- Micropipettes are used to deliver predetermined volumes and dispense a known aliquot.
- Micro blood collection tubes are used to draw blood samples.



Electronic Packages and Envelopes

Glass is used in numerous electronic applications where discrete electronic components must be protected, isolated or sealed. Some applications include reed switch bodies, fuse bodies, diode packages, lamps, transponders and thermistors. The glass tubes can be used for insulation, passivity and hermetic sealing.

We use a wide variety of glass materials to provide virtually any design required. Each product is designed and manufactured for a specific application.



Fiber Optic Components

Accu-Glass manufactures glass ferrules, collimator tubes and various types of spacers for fiber optic component manufacturers.

Fiber Optic Ferrules –

Whether a single fiber is terminated at a device or joined to another fiber, a ferrule or connector of some type is commonly used. These high precision parts ensure the fiber is optimally aligned. Borosilicate glass ferrules are the ideal material for superior polishing and permit UV curable adhesive applications in assembly.

Fiber optic ferrules manufactured by Accu-Glass use a proprietary process to form an inner funnel in one end, which helps guide the fiber into the ferrule and reduce fiber bending stress.



Ampoules

Accu-Glass manufactures glass ampoule blanks that are used for packaging and dispensing a wide variety of liquid products.

Generally, the glass tubing used in ampoules is 7 mm in diameter and the finished ampoules can be any length. Accu-Glass fire-cuts the tubing to length and closes one end by flame sealing. Our customers fill the blank ampoule with the material to be dispensed and then either heat-seal the open end or insert a cotton swab. Most filled ampoules are inserted in a thin fiber sleeve for protection. The final consumer packaging is either in bulk or dispensed individually.

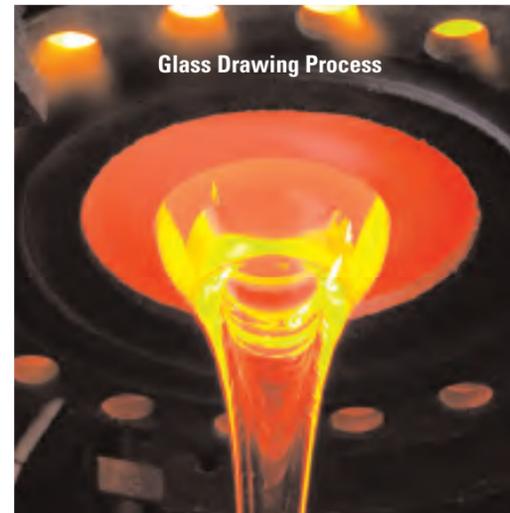
Accu-Glass helps OEM manufacturers around the world solve problems with innovative, cost-effective solutions. Our precision glass products and proprietary glass forming processes allow the fastest response in the industry.

TOLERANCE

Accu-Glass Forming and Finishing Processes

Glass Tube Forming

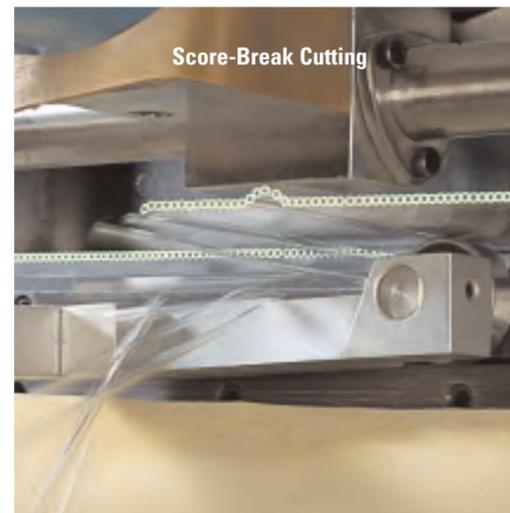
At Accu-Glass, tubing and rods are formed by a unique Direct Draw process. The material is continuously "pulled" from a vessel of molten glass. The advantage of this process over conventional "tank drawn" or "redrawn" tubing is that a wide range of geometric shapes and precise tolerances are achieved. Additional advantages are the ability to manufacture lower volume runs economically and provide very short turn-around time from order to shipment. The unique tooling utilized is designed and fabricated on site by Accu-Glass personnel to meet specific customer needs.



Cutting

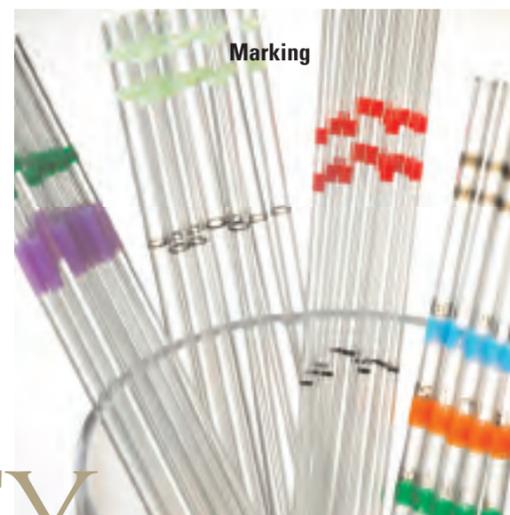
Accu-Glass provides a variety of cutting processes depending on the application. The score-break method is implemented when high production speeds are required. If the product does not require special cleaning, our "dry-cut" process is the most economical. Length tolerances are generally ± 0.010 inches.

When tighter tolerance specifications are required, the precision diamond saw cutting method is used to meet length and end cut requirements. This method employs a gang arbor of stacked diamond cutting blades that are liquid cooled, which are typically mounted in a CNC machine.



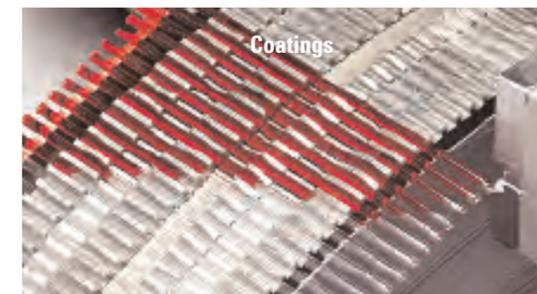
Marking/Decorating

These markings typically are used to designate volumetric size or specify a volumetric calibration point with a tolerance of $\pm 0.25\%$ for accuracy and precision of 0.5% or less. Accu-Glass offers multiple colors and configurations.



Flame Polishing

High speed flame polishing is used to smooth sharp edges that can occur during the cutting process. This makes the tube more durable and safer to handle. Additionally, the smoothing effect provides easier insertion capabilities for assembly situations.



Coatings

Unique coatings can be applied to the internal surfaces of the tube to meet specific needs. Accu-Glass has a long history of providing products with various reagents or chemicals applied to the inner surface, such as heparin, monoclonal antibodies, silicone, and EDTA.



Packaging

Accu-Glass offers many variations of product packaging to conform with your production operations.

Accu-Glass is ready to assist you in design and development of your glass application. Let our team of experts show you the true benefits and performance results you can only achieve with glass.

FLEXIBILITY

PRECISION

SPECIALIZED

TOLERANCE

FLEXIBILITY



Accu-Glass 

Committed to the highest standards of excellence in everything we do.

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