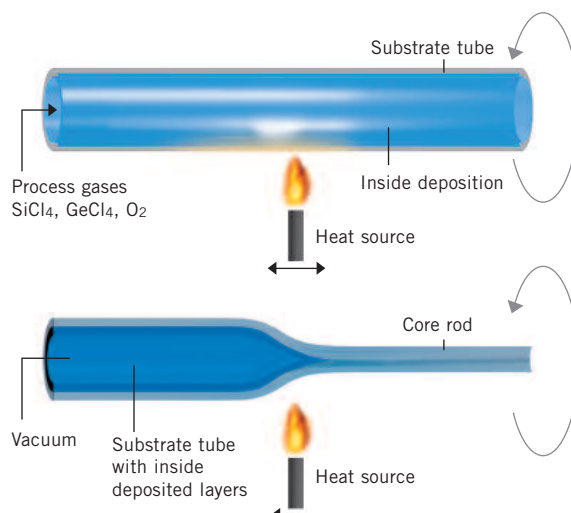


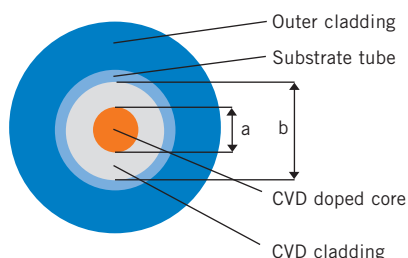
## High Purity Synthetic Fused Silica Substrate Tubes

Heraeus substrate tubes are the premier choice for production of core rods for single mode, multimode, and specialty optical fibers. Our tubes are utilized in MCVD (Modified Chemical Vapor Deposition) and similar deposition processes used to manufacture core rods. The core material of the final fiber results from the deposition of multiple layers of pure and doped fused silica on the inner surface of the substrate tube. Oxygen-hydrogen burners, electrical furnaces or plasma torches can be used as energy sources for these chemical deposition processes using Heraeus' substrate tubes. Once the core material is deposited, the tube is gradually collapsed into a solid core rod under high heat and vacuum.



The most important features of Heraeus substrate tubes are their unmatched purity and low hydroxyl (OH) content. These characteristics combined with a wide range of available geometries enable our customers to design core rods in such a way that the substrate tube material can be in close proximity to the core region of the fiber. In the case of low water peak fibers, it is now possible to achieve b/a values well below 2.5 for single mode fibers, considered to be state-of-the-art for inside CVD preforms. This low b/a allows our customers to produce larger core rods, increasing the efficiency and productivity of their CVD lathes while maximizing fiber quality and yield.

### Single mode fiber



### Highest purity enables best performance

For single mode and multimode fibers, Heraeus offers two material grades, F300 and F500. Both materials are characterized by a very low OH content. F300 grade with OH levels below 1 ppm is the long-time standard in the fiber optics industry. Heraeus' advanced F500 grade is an optimized water-free material, with OH levels below 100 ppb, for low water peak applications. Our substrate tubes are drawn, without using forming dies, from large machined cylinders of the highest purity synthetic fused silica. This contact-free process produces tube surfaces free of contamination and, consequently, fiber with high mechanical strength. Typically, metallic impurities are in the sub-ppb level, which is below the detection limit of inductively coupled plasma mass spectrometry (ICP-MS).

	F300	F500
<b>OH [ppm] specified</b>	≤ 1	≤ 0.1
<b>typical</b>	0.2	0.02
<b>Chlorine [ppm]</b>	≤ 2,500	≤ 2,500
<b>Trace impurities</b>	Below detection limit of ICP-MS	

Typical values, if not stated otherwise

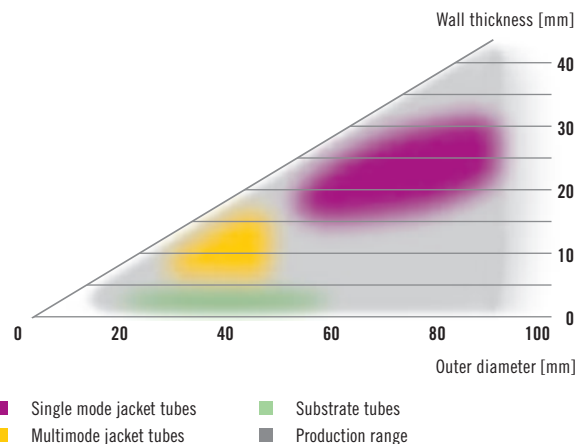
Germany  
**Heraeus Quarzglas GmbH & Co. KG**  
 Quarzstraße 8  
 63450 Hanau  
 Phone +49 (0) 6181.35-6324  
 Fax +49 (0) 6181.35-6261  
 fiber-optic-sales-de@heraeus.com  
 www.heraeus-quarzglas.com

USA  
**Heraeus Tenevo LLC**  
 100 Heraeus Blvd.  
 Buford, GA 30518  
 Phone +1 678.804-1021  
 Fax +1 678.804-1023  
 fiber-optic-sales-us@heraeus.com  
 www.heraeus-quarzglas.com

### Geometry

Because our proprietary tube drawing process is flexible and capable of high geometric precision, Heraeus is able to offer a wide range of geometries for substrate tubes. The outside diameter and wall thickness can be precisely adjusted to the customer's requirements.

#### Available Tube Sizes



#### Typical Geometrical Performance

<b>Outer diameter</b>	+/- 0.1 ... 0.2 mm
<b>Wall thickness</b>	+/- 0.08 ... 0.2 mm
<b>Ovality</b>	0.03 ... 0.07 mm
<b>Siding</b>	0.07 ... 0.12 mm
<b>CSA deviation*</b>	1 ... 2 %
<b>Bow</b>	0.2 ... 0.4 mm/m

\*Variation of cross-sectional area within a tube

### About us

Heraeus is the key global supplier of high purity synthetic fused silica products for optical fiber manufacturing. We have been a reliable partner in the world telecommunications industry since 1976.

We are certified for ISO 9001:2000 and our Total Quality Management system is based on the Business Excellence Model of the European Foundation for Quality Management (EFQM).