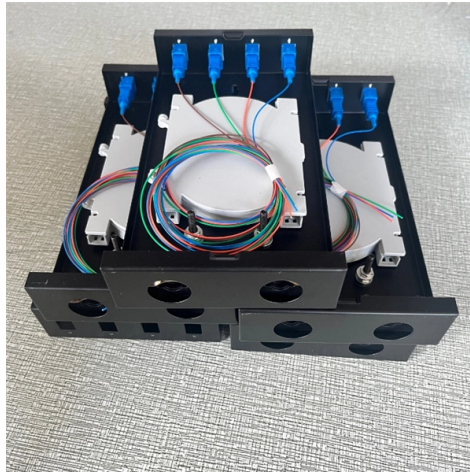


Long-distance optical cable production



Article Overview

Long-distance optical cables are manufactured through a precise sequence of steps, from ultra-pure silica preforms to fiber drawing, protective coating, cabling, and rigorous testing to ensure high-speed, low-loss data transmission.

Raw Material Preparation

The process begins with ultra-pure silica (SiO_2), often derived from silicon tetrachloride, sometimes doped with germanium tetrachloride to optimize light-guiding properties for the fiber core. The purity of silica is critical to minimize signal loss over long distances. For single-mode fibers (SMF), which are used in long-distance telecommunications, the core diameter is extremely small, allowing precise light transmission with minimal dispersion.

Preform Fabrication

The silica is converted into a preform, a large glass rod that mirrors the structure of the final fiber. Techniques include:

- Modified Chemical Vapor Deposition (MCVD): Gases like SiCl_4 and GeCl_4 are introduced into a rotating quartz tube and locally heated with a flame to deposit layers of doped silica on the inner surface.
- Plasma Chemical Vapor Deposition (PCVD): Uses plasma to deposit high-purity glass layers at lower temperatures, reducing hydroxide impurities.
- Outside Vapor Deposition (OVD): Deposits silica layers on a rotating rod via flame hydrolysis, building up the preform concentrically

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