smiths interconnect

Fiber Optics

Smiths Interconnect offers both multimode and single-mode fiber optic contacts. Both types consist of two basic components: the core and the cladding, which traps the light in the core. Fiber optic contacts support wide bandwidth applications and are suitable for inclusion in a broad variety of connector styles. All fiber optic connectors and contacts are offered fully terminated and tested ensuring signal integrity for rugged application environments.

Features:

- Floating fiber, butt-joint and expanded beam technologies
- Single and multi-mode applications
- Extremely wide bandwidth
- Low insertion loss

Background

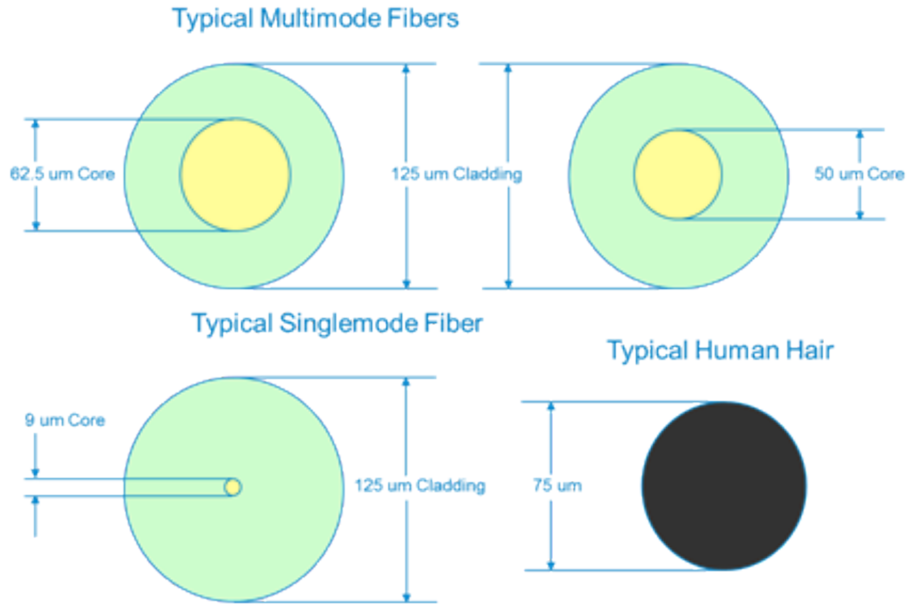
Over the past several years, fiber optical cable has become more affordable. It's now used for dozens of applications that require complete immunity to electrical interference. Fiber is ideal for high data-rate systems or any other network that requires the transfer of large, time-consuming data files.

Other advantages of fiber optic cable over copper include:

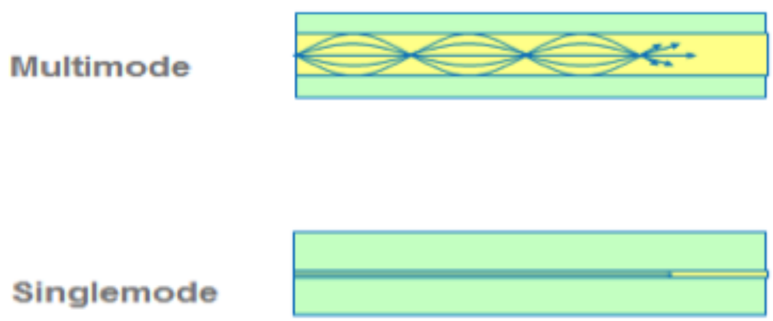
- **Greater distance:** You can run fiber as far as several kilometers.
- **Low attenuation:** The light signals meet little resistance, so data can travel farther.
- **Security:** Taps in fiber optic cable are easy to detect. If tapped, the cable leaks light, causing the system to fail.
- **Greater bandwidth:** Fiber can carry more data than copper.
- **Immunity**: Fiber optics are immune to interference.

Single-Mode or Multimode?

There are two basic types of fiber: mulitimode fiber optics and single-mode fiber optics. Both types consist of a two basic components: the core and the cladding which traps the light in the core. Typical multimode fiber core diameters are 50, 62.5, and 100 microns. Single-mode optical fiber has a much smaller core, typically 5 to 10 microns.



In fiber cable, light is carried down the core. The larger the core, the greater the amount of light paths or modes. In fiber cable, the light source emits photons down the fiber core. Each photon carries the same signal down the path (or mode). But only one photon is required for an optical signal to be received.



In multimode fiber, multiple photons (or modes of light) travel down the fiber core. However, in long cable runs (greater than 3000 feet [914.4 m]), multiple paths of light can cause signal distortion at the receiving end, resulting in an unclear and incomplete data transmission.

In single-mode fiber, the reduced core size allows only a single photon (or one light mode) to travel down the core. Single-mode fiber gives you a higher transmission rate and up to 50 times more distance than multimode, but it also costs more. The small core and its single lightwave virtually eliminate any distortion that could result from overlapping light pulses, providing the least signal attenuation and highest transmission speeds of any fiber cable type.

Testing and Certifying Fiber Optic Cable

It's easy to certify fiber optic cable because of its immunity to electrical interference. You only need to check a few measurements:

Attenuation *(or decibel loss)*: Measured in dB/km, this is the decrease of signal strength as it travels through the fiber optic cable.

Return loss: The amount of light reflected from the far end of the cable back to the source. The lower the number, the better. For example, a reading of -60 dB is better than -20 dB.

Graded refractive index: Measures how much light is sent down the fiber. This is commonly measured at wavelengths of 850 and 1300 nm. Compared to other operating frequencies, these two ranges yield the lowest intrinsic power loss. (NOTE: This is valid for multimode fiber only.)

Propagation delay: This is the time it takes for a signal to travel from one point to another over a transmission channel.

Time-domain reflectometry (TDR): Transmits high-frequency pulses so you can examine the reflections along the cable and isolate faults.

Basic fiber optic testers function by shining a light down one end of the cable. At the other end, there's a receiver calibrated to the strength of the light source. With this test, you can measure how much light is going to the other end of the cable. Generally, these testers give you the results in decibels (dB) lost, which you then compare to the loss budget. If the measured loss is less than the number calculated by your loss budget, your installation is good.

Newer fiber optic testers have a broad range of capabilities. They can test both 850- and 1300-nm signals at the same time and can even check your cable for compliance with specific standards.

When to Choose Fiber Optic

Although fiber optic cable is still more expensive than other types of cable, it's favored for today's high-speed data communications because it eliminates the problems of twisted-pair cable, such as near-end crosstalk (NEXT), electromagnetic interference (EMI), and security breaches.