

Comparison of Multimode Fibers



Overview

Single Mode vs. Multimode Fiber Optic Cables There are two main types of fiber optic cables: single mode and multimode. Although they Multimode Fiber Types.

Key Takeaways

Multimode fibers differ in core size, bandwidth, supported data rates, maximum distances, optical sources, and applications, with OM1/OM2 suited for legacy networks and OM3/OM4/OM5 optimized for high-speed data centers.

Overview of Multimode Fiber

Multimode fiber (MMF) has a larger core diameter (50–62.5 μm) than single-mode fiber, allowing multiple light modes to propagate simultaneously. This enables short-range, high-bandwidth communication using lower-cost optical sources like LEDs or VCSELs, making MMF ideal for data centers, enterprise LANs, and campus networks . ISO/IEC 11801 defines five main types: OM1, OM2, OM3, OM4, and OM5.



Key Comparisons	Fiber Type	Core Size	Jacket Color	Optical Source	Bandwidth (MHz·km)	Max Distance (10G Ethernet)	Typical Use
	OM1	62.5 µm	Orange	LED	200 @ 850 nm	33 m	Legacy 100Mb/s–1Gb/s networks
	OM2	50 µm	Orange	LED	500 @ 850 nm	82 m	1G Ethernet, limited 10G
	OM3	50 µm	Aqua	VCSEL	2000 @ 850 nm	300 m	10G Ethernet, 40G/100G short links
	OM4	50 µm	Aqua	VCSEL	4700 @ 850 nm	550 m	10G/25G/40G/100G, longer distances than OM3
	OM5	50 µm	Aqua/Erin Violet	VCSEL, SWDM	4700 @ 850 nm, 2470 @ 953 nm	Similar to OM4	for 10G/25G

Supports SWDM for 40G/100G/400G using fewer fibers

Detailed Insights

- OM1 and OM2: Early-generation fibers with LED sources, suitable for short distances and lower-speed networks. OM1 has a larger 62.5 µm core, while OM2 uses 50 µm. Both are largely obsolete for modern 10G+ applications .
- OM3 and OM4: Laser-optimized 50 µm fibers designed for VCSEL-based transceivers, supporting higher bandwidth and longer distances. OM4 improves on OM3 with enhanced modal bandwidth, making it the mainstream choice for new data center deployments .
- OM5: Introduced in 2016 as Wideband Multimode Fiber (WB-MMF), OM5 supports Short Wavelength Division Multiplexing (SWDM), allowing multiple wavelengths (850–940 nm) on a single fiber. This reduces fiber count for high-speed 40G/100G/400G applications, though adoption is limited due to higher cost and SWDM module availability .

Practical Considerations

- Distance vs. Data Rate: Higher-speed links (40G/100G) require OM3/OM4/OM5 for distances beyond 100 m. For most enterprise links under 100 m, OM3 performs similarly to OM4, making OM4 sometimes costlier without added benefit .
- Optical Source Compatibility: OM1/OM2 use LEDs, while OM3/OM4/OM5 are optimized for VCSEL lasers, which are more efficient and cost-effective for high-speed applications .
- Color Coding: OM1/OM2 are orange, OM3/OM4 aqua, and OM5 uses aqua or Erin violet for easy identification .
- Deployment: OM1/OM2 are mostly found in legacy buildings, while OM3/OM4/OM5 are standard in modern data centers and enterprise networks .

Conclusion

Choosing the right multimode fiber depends on network speed, distance, optical source, and budget. For legacy or low-speed networks, OM1 or OM2 may suffice. For modern high-speed data centers, OM3 or OM4 is cost-effective, while OM5 is ideal for future-proofing with SWDM and ultra-high-speed applications. Understanding these differences ensures reliable, scalable, and cost-efficient network design .

Article Content

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Identified by ISO 11801 standard, multimode fiber optic cables can be classified into OM1

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