ZITHA TECH SPECIALTY CABLES (Pty) Ltd

Fiber Optic Cable Excess Length Protection Quota



Overview

The method to calculate the excess fiber length in a stranded loose tube fiber optic cable is very easy.

Key Takeaways

Excess Fiber Length (EFL) is the additional fiber length built into a cable to protect optical fibers from mechanical stress, thermal expansion, and bending, typically ranging from 0.5% to 3% depending on cable design.Purpose of Excess Fiber Length

EFL is incorporated into fiber optic cables to prevent fiber damage under mechanical and thermal stress. When a cable is bent, stretched, or exposed to temperature fluctuations, the cable structure elongates or contracts. The excess fiber ensures that the optical fiber itself does not experience tension or compression that could degrade performance or cause breakage . In metal tube cables, EFL compensates for differential thermal expansion between the fiber and the tube, preventing excessive tensile load on the fiber .

Typical EFL Values
• Stranded loose tube cables: EFL is typically 2–3% of the cable length .

• Central tube (mono-tube) cables: EFL is usually 0–1%, as the fiber is more constrained and less prone to elongation .

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• General design range: 0.5–1.5% is common for standard fiber optic cables to protect against bending and tension .
Calculation of EFL

In stranded cables, EFL arises from the helical stranding of loose tubes around a central strength member. The fiber length exceeds the linear cable length due to the spiral path, which can be calculated using the stranding radius (R) and lay length (pitch) of the helical structure . The formula considers the stranding angle and the circumference of the stranding circle to determine the additional fiber length required. For loose tube manufacturing, EFL is also controlled during extrusion and stranding processes to account for post-extrusion shrinkage and installation elongation . In metal tube cables, real-time EFL monitoring ensures precise compensation for thermal expansion during production .

Practical Implications
• Mechanical protection: EFL prevents fiber breakage during bending, pulling, or tension.

• Thermal compensation: In cables with metal tubes, EFL allows the fiber to remain stress-free despite temperature-induced expansion or contraction of the tube .

• Installation and maintenance: Properly designed EFL ensures that fibers can withstand installation stresses without microbending or signal loss .

• Quality control: Modern production lines use real-time EFL monitoring to maintain consistent fiber length across multiple fibers, ensuring reproducibility and reliability .
In summary, the EFL protection quota is a critical design parameter that balances fiber safety, cable performance, and manufacturing precision. Its value depends on cable type, environmental conditions, and intended application, and it is carefully controlled during both production and installation.

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Ch 5-Fiber Optic Cable

5.5.6 Fiber Optic Splice Enclosures - Wherever a butt-splice (full end-to-end splice of fiber optic cables) is required or where a fiber

FIBEROPTIC LOOSE TUBE MANUFACTURING AND POST

Loose tube fiber optic cables are commonly employed in long-haul, metro-core, access, distribution, indoor or

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Outside Fiber Optic Cable Design | Corning

Corning discusses the considerations in outside fiber-optic cable design including loose tube, ribbon, and micro loose tube cabling.

CLEANING AND TESTING PARALLEL OPTICS

The 1990s saw the emergence of rib-bon cable designs. This cable allowed for higher fiber counts and offered a time and cost

Fiber-optic cable

A fiber-optic cable, also known as an optical-fiber cable, is an assembly similar to an electrical cable but containing one or more

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