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Whitepaper

Next-Gen Microcables

Driving 2X Denser and Faster Fiber Deployment Through Increased Jetting Speed

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Gateway to the Digital Age: Introduction

We are living in a connected world, a world where technology bridges gaps and people are linked across vast distances. The internet, social media, and advanced communication systems have woven an intricate web of connectivity that transcends borders and cultures. Information flows freely, ideas are exchanged, and collaboration knows no bounds. In this connected world, geographic barriers are no longer impediments to communication and interaction.

According to The Business Research Company, the telecom market value reached a staggering 3.048.1 billion USD in 2023. This represents an annual growth rate of 6.0% for the global telecom industry. The upsurge can be attributed to shifting consumer behavior influenced by the COVID-19 pandemic and the heightened demand for data consumption among mobile device users.

However, amidst the advantages of this connected world, challenges and considerations arise. Ensuring equitable access to technology and bridging the digital divide is one crucial aspect, as connectivity should be accessible to all, regardless of socioeconomic status or geographical location.

But have you ever wondered about the driving force behind this seamless connectivity? Curious about the invisible hands that enable data to traverse vast distances? The answer lies in a singular marvel: Optical Fiber Cables! These remarkable strands of technology form the backbone of our interconnected world, diligently working behind the scenes to make it all possible.

A Quick Look at the Numbers

2022 In 2022, the wire and cable industry witnessed the Asia Pacific region emerging as the frontrunner, capturing the largest revenue share with an impressive 37.4% market dominance.

2025 While the demand for wires and cables is expect to remain stable in North America, Europe is projected to experience substantial growth in the coming years, driven by initiatives like the Digital Agendas for Europe 2025.

2027 With the global fiber optics market projected to reach USD $9.73 billion (USD) by 2027 (Source-GlobeNewsWire), the demand for fiber optic cables across industries is only going to increase.

But among the various types of optical fiber cables that enable seamless connectivity, one particular cable stands out: Microcable. This specialized cable, with its slender and compact design, plays a vital role in our interconnected world.

With their compact size and advanced capabilities, microcables have become widely utilized in communication networks. But do you know what challenges led to development of these cables that have emerged as higher density alternate to conventional solutions?

Challenges in Optical Fiber Deployment

When we talk about high-capacity networks, the deployment of optical fibers presents numerous challenges that can make the installation process quite daunting. Two significant challenges that network operators face are limited space in the distribution network and tighter bends in the subscriber loop.

"Extreme constraints in duct space, length, and geometry have limited the use of conventional microcable solutions."

To provide services to a large number of subscribers, high fiber count optical fiber cables are required to carry a significant volume of information. However, the installation of these cables becomes difficult due to the limited space within the existing ducts.

As the fiber count increases, the cable diameter also increases, making it challenging to fit these cables into the available infrastructure.

This poses a significant problem as expanding the existing duct network can be expensive and time-consuming. It involves extensive civil work and requires obtaining approvals from governmental and local authorities, which adds to the complexity and delays in the deployment process. As a result, with conventional microcable, the limitations of existing ducts may only allow installation of cables with insufficient capacity.

Another challenge is the presence of tighter bends in the subscriber loop. Optical fibers are often required to navigate through bends and corners in the network infrastructure, especially in the last-mile connections to subscribers' premises. However, tighter bends can introduce signal loss and degradation, impacting the overall performance of the network. With traditional optical fiber cables, these tighter bends can result in increased optical power loss and reduced signal quality. This challenge becomes even more critical as network operators strive to provide high-speed and reliable connectivity to their subscribers.

To overcome these challenges, innovative solutions are required in optical fiber deployment.

"The optical fiber market in India is anticipated to experience significant growth, driven by government initiatives like "Make in India" and the "Go Green" policy. These initiatives will further strengthen the wire and cable industry in the country, creating favorable conditions for its development."

Conventional 200 µm Microcable

Fiber Count	Cable OD (mm)	Duct Size (mm)	Jetting distance (m)	Average speed (m/min)
96	5.2	10/6	no attempt: fill ratio 85%	
144	6.8	14/10	2000	71
288	8.1	14/10	1700	42
432	9.5	16/12	1500	74
576	10.2	16/12	no attempt: fill ratio 85%	

Jetting performance of conventional 200mm microcable on IEC standard track

Threads of Connection: Unraveling Microcables

Here are some key aspects and components of microcables

Microcables, as the name suggests are micro-optic cables that are characterized by their small size and diameter, typically up to 12 millimeters. They are significantly thinner and more flexible compared to standard cables, allowing for easy installation in tight spaces or environments where limited physical space is available.

Optical Fibers

Microcables typically contain multiple groups of optical fibers. Optical fibers are used when transmitting light-based signals, such as in fiber optic communication systems.

Fiber Coatings

Each fiber within a microcable is coated with a thin layer of material to protect the core and enhance its performance. Telecommunications grade optical fibers are typically coated with acrylate thermoset materials. Coated optical fibers for telecommunications typically have a diameter of 250µm for standard applications, and 200µm for high-density applications.

Bundling and Buffering

The individual fibers within a microcable are often bundled together and surrounded by buffering materials. These buffering materials act as a cushion and provide additional protection against physical stress, bending, and other external factors that could damage delicate fibers. Buffered subunits in microcables can be easily routed, managed, and connected, saving time and effort during installation.

"Notably, the North American region has witnessed a significant surge in data consumption, prompting major telecommunication giants to invest in robust fiber networks."

Protective Sheath

Microcables have a protective outer sheath that provides mechanical strength, durability, and protection against environmental factors. The sheath is typically made of materials such as PE (Polyethylene), PVC (Polyvinyl Chloride), or LSZH (low smoke zero halogen) depending on the specific application requirements.

Fusion Splicing and Connectors

Microcables are designed to be compatible with common termination methods, including fusion splicing, factory connectorization or field connectotization, depending on the application. These methods of termination allow for easy and reliable connection to devices, equipment, or other cables, ensuring efficient data transfer.

Performance and Specifications

Microcables come with various specifications and performance ratings, depending on the intended application. These specifications may include parameters such as fiber attenuation, tensile strength, and temperature service window.

It's just the tip of the iceberg, things are going to get more interesting, so we recommend you scroll down and learn about the latest and insightful details on microcables.

Smaller Size, Greater Impact: HFCL's Innovative Microcables

Introducing the Smallest and Best Installation Performance Solution in the Market

In the fast-paced world of telecommunications, network operators face the constant challenge of maximizing efficiency while minimizing costs. At HFCL, we understand the pressing need for innovative solutions that address these demands head-on.

With our latest breaktrough, a family of ultra-compact microcables using 200µm fiber, we are offering a game-changing solution that can increase cable jetting speed up to 29% compared to conventional microcable using 200µm fiber. Below, we describe the performance of the 288-fiber version of this family as an example of its benefits.

Highlights of our 288-fiber Microcable

A Compact Marvel

Our new Nano Thin 288 F microcable set new industry standards by seamlessly combining a high fiber count with an ultra-compact design, boasting a mere 7.4mm diameter. This breakthrough not only saves valuable space in the distribution network but also significantly reduces the carbon footprint, making it an eco-friendlier choice.

Unmatched Performance

Our microcable's exceptional performance is a result of relentless engineering and rigorous testing.

The optimized stiffness and UV-stabilized low-friction outer jacket enable longer, faster, and hassle-free cable jetting, empowering network operators to deploy connections with ease and efficiency.

To ensure reliability, our cables have been throroughly tested using our IEC 60794-1-21 E24 compliant blowing test track. For example, this 288-fiber cable has jetted 2km in 14/10mm microduct.

Moreover, our microcables operate flawlessly even in extreme temperatures, ranging from -40°C to +70°C. Furthermore, our microcables are available with cost-effective G.657.A1 fiber with a 9.1 µm nominal mode field diameter, supporting low-loss splicing to the installed base of G.652.D fiber.

Certified Cables

We understand the importance of compatibility and seamless integration within existing networks. That's why our microcables are available with ITU-T-compliant G.657.A1 and G.657.A2 fibers, offering flexibility for a wide range of applications. Furthermore, our fiber is fully compatible with legacy G.652.D fiber networks that allows First Time Right (FTR) Installation. Our commitment to quality is evident in the compliance of our cables with industry standards, such as IEC 60794-5-10 and Telcordia GR-20-CORE.

Jetting Optimized

Sustainability at the Core

One of the key advantages of our microcable solution lies in its ability to reduce the overall cost of network expansion by eliminating the need for extensive groundwork. This not only saves time and money but also minimizes the consumption of raw materials, making it an environmentally conscious choice. We believe in contributing to a greener future, and our microcables are a testament to that commitment.

Fiber Count	New compact 200 µm Cables		Conventional 200 µm Cables	
	Dia. (mm)	Packaging density (fibers/mm²)	Dia. (mm)	Packaging density (fibers/mm²)
96	4.6	5.8	5.2	4.5
144	6.0	5.1	6.8	4.0
288	7.4	6.7	8.1	5.6
432	8.2	8.2	8.5	6.1
576	9.5	8.1	10.2	7.0

Benefits of HFCL Microcables

Blow Optimized

Our microcables are designed to be compatible with air-blown installation techniques, which enables faster and more efficient deployment.

The reduced cable diameter and lightweight nature of our microcables make them easier to blow into conduits or microducts.

Reduced Cable Diameter

HFCL's microcables have a smaller diameter compared to traditional cables, allowing for higher fiber density within the same physical space.

The reduced diameter also makes it easier to install microcables in tight spaces or existing conduits without the need for costly and time-consuming infrastructure modifications.

Variants of Our Microcable	Most Bend Sensitive Fiber Type Qualified	Fiber Count		Cable Diameter (mm)
		Tube	Cable	
Standard Microcable	250 µm, G.657.A1	12-24	24-576	5.8-12.5
Extra Thin Microcable	250 µm G.657.A1 (12 f/t) & 200µm G.657.A1 (24 f/t)	12-24	24-576	5.2-11.2
Ultra Thin Microcable	250 µm, G.657.A1	12-24	24-576	4.5-10.2
Nano Thin Microcable	200 µm, G.657.A1	12-24	96-576	4.6-9.5
Aramid Reinforced Blown Unitube Cable	250 µm, G.657.A1	----	12-24	2.5-3.0
Blown Unitube Cable (No Aramid)	250 µm, G.657.A1	----	12-24	2.0-2.4

Enhanced Jetting Performance

Our next-generation cables with 200µm fiber have been tested and confirmed to support improved jetting speed, as much as 29% higher than conventional 200µm cables. In addition, these next-generation compact cables achieve longer jetting distances on the industry-standard IEC 60794-1-21 Method E24 “N x 100 meter” test track.

The enhanced jetting performance of our cables enables faster installation speeds and/or increased maximum fiber counts within ducts. The faster installation speeds and increased fiber count capabilities help streamline deployment processes, reduce costs, and enhance the overall performance of fiber optic networks.

Easy to Handle

The smaller size and lighter weight of our microcables make them easier to handle during installation.

HFCL’s microcables can be maneuvered more easily, with reduced bend radii, enabling installation in challenging environments or areas with limited access.

Super Lightweight

Our microcables are significantly lighter in weight than conventional cables, making them easier to handle and transport.

The lightweight nature of these microcables reduces the physical strain on installation crews, improving efficiency and reducing the risk of injuries during installation.

Reduced Risk of UV and Chemical Damage

Our microcables offer proven durability against the harmful effects of UV rays and select chemicals, resulting in reduced potential for damage.

The reduced risk of cable damage minimizes the need for repairs or replacements, resulting in cost savings and improved network reliability.

New compact 200 µm cable

Fiber count	Cable OD (mm)	Duct size (mm)	Jetting distance (m)	Average speed (m/min)
96	4.6	10/6	1400	39
144	6.0	12/8	2000	65
288	7.4	14/10	2000	54
432	8.2	14/10	760	36
576	9.5	16/12	2000	62

Smaller Drums/Efficient Logistics

Due to their compact size, our microcables can be wound onto smaller cable drums, resulting in more efficient logistics and transportation.

Smaller cable drums occupy less space, making it easier to store and transport them to different installation sites.

Highly Scalable and Flexible

These microcables offer high scalability, allowing for easy expansion or upgrades of the fiber network without significant infrastructure modifications.

The flexibility of our microcables enables them to be deployed in various network architectures, including point-to-point and point-to-multipoint configurations.

Final Words:

Our innovative design isn't just about saving you time and money; it's about reducing the overall cost of network expansion by minimizing the need for extensive groundwork. That means less extensive groundwork, fewer raw materials, and an eco-friendlier solution.

About HFCL

At HFCL, we are a trailblazing global technology company dedicated to connecting billions of people, devices, and systems. With a strong focus on innovation, we design, develop, and manufacture cutting-edge telecommunications equipment, fiber-optic cables, and other related electronics. Our commitment to technological advancement and quality has positioned us as a leading player in the industry. With a rich legacy and a global presence, we are driven by our passion to empower networks and revolutionize the way people communicate. By leveraging our expertise and innovative solutions, we enable seamless connectivity and enhanced reliability, shaping the future of digital and telecommunications.