



Customization process for low-temperature resistant optical cable terminal box for intelligent computing centers

Article Overview

Custom low-temperature resistant optical cable terminal boxes are designed through a process that integrates material selection, structural design, environmental sealing, and quality control to ensure reliable fiber management in intelligent computing centers.

Material Selection

The first step in customization involves selecting high-strength, low-temperature resistant materials. Common choices include ABS, PC (polycarbonate), and flame-retardant engineering plastics, which provide impact resistance, UV stability, and durability under extreme cold conditions. Metal components, such as stainless steel or aluminum alloy, are used for internal brackets, screws, and joints to enhance mechanical strength and corrosion resistance .

Structural and Environmental Design

The terminal box housing is engineered to protect fibers from mechanical damage, moisture, and temperature fluctuations. For low-temperature environments, the design must ensure that materials maintain flexibility and do not become brittle at sub-zero temperatures. Key design features include:

- o IP65/IP68-rated sealing for dust and water protection .
- o Thermal insulation and rubber gaskets to maintain internal temperature stability.
- o Cable entry ports with strain relief to prevent fiber stress during installation and operation .
- o Internal splice trays and routing organizers to maintain a minimum bending radius (typically $\geq 30\text{mm}$) for optical fibers .

Customization and ODM/OEM Process

Customization is driven by the specific requirements of the computing center, including fiber density, splitter integration, and mounting preferences. The process typically includes:

- o Requirement Analysis: Assessing the number of fibers, splitter types (e.g., PLC 1:4, 1:8), and environmental conditions.
- o Conceptual Design: Creating CAD models and prototypes tailored to low-temperature performance and intelligent network integration .
- o Material Testing: Verifying that selected plastics and metals withstand low temperatures without cracking or



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warping.

- o Prototype Production: Using injection molding and precision assembly lines to produce sample units for testing .
- o Client Review and Iteration: Adjusting design based on feedback regarding fiber management, accessibility, and environmental resilience.

Assembly and Fiber Management

Once the design is finalized, the terminal box is assembled with:

- o Splice trays for fusion or mechanical splicing.
- o Adapter panels for patch cord connections.
- o Heat-shrinkable tubes and epoxy resin for secure fiber fixation and insulation .
- o Cable routing guides to maintain proper bend radius and prevent fiber damage.

Quality Control and Testing

A robust quality control system ensures reliability in low-temperature environments:

- o Incoming material inspection (IQC) for plastics, metals, and sealing components .
- o Environmental testing for temperature extremes, UV exposure, and moisture ingress.
- o Mechanical testing for impact resistance and vibration tolerance.
- o Sealing verification using heat-shrinkable tubes, rubber gaskets, and aluminum foil wraps to achieve IP65/IP68 protection .

Installation Considerations

For intelligent computing centers, installation involves:

- o Wall or rack mounting using expansion bolts or brackets.
- o Cable entry through waterproof inlets with strain relief.
- o Splicing and adapter connection while maintaining minimum bending radius.
- o Integration with intelligent network monitoring systems to support real-time fiber management and 5G/IoT infrastructure .

Summary



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The customization of low-temperature resistant optical cable terminal boxes combines material engineering, precise structural design, environmental sealing, and rigorous quality control. This ensures that the terminal boxes can reliably manage high-density fiber networks in intelligent computing centers, withstand harsh environmental conditions, and support efficient installation and maintenance .

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Based on the needs list and industry standards, a customized solution is designed, specifying details such as fiber optic cable type,

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A Fiber Termination Box, also known as an optical termination box (OTB), is a compact, specialized enclosure

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