Corning® Vascade® Optical Fibers
Product Information

Customized Solutions for Maximum Performance and Reliability
The Corning® Vascade® family of submarine optical fibers provide high-speed, high-capacity solutions for transoceanic and short-haul submarine networks, guaranteeing the performance and reliability necessary in the harsh undersea environment.

Submarine systems, from unrepeatered networks spanning a few hundred kilometers to repeatered networks spanning the world’s oceans, demand the most advanced optical technologies. Each Vascade fiber type has a unique optical profile to allow customized system solutions, however, they all share the fundamental characteristics inherent to Corning’s submarine fibers: high mechanical reliability, high optical stability, and matched and managed optical properties.

In addition to individual Vascade fibers, Corning also offers customized Vascade fiber solutions with coloring and splicing options.

High Mechanical Reliability
Submarine fiber-optic cables experience high tension during deployment and recovery from the ocean floor. With this in mind, every Vascade fiber is subjected to a 1.38 GN/m² (200 kpsi) proof test, double that of the typical terrestrial fiber. In addition, Corning has dedicated manufacturing lines reserved especially for Vascade fibers. Corning’s patented manufacturing process ensures high-quality fibers that offer maximum performance and economic advantage for your network. Vascade fibers are colored and spliced in a clean room environment and receive additional strength testing to ensure the fiber’s long-term reliability.

Comprehensive Fiber Data
Corning Vascade fibers come with an unparalleled wealth of measured data. Corning’s state-of-the-art measurement systems allow us to provide comprehensive fiber data packages for every spool of fiber.

Coloring Options
To meet the unique requirements of each submarine network, all Vascade fibers can be supplied in different colors.
**Individual Vascade® Optical Fibers**

**Vascade® L1000 Fiber**
A large effective area fiber, Vascade L1000 fiber has applications in both repeatered and unrepeatered submarine systems. In unrepeatered systems, Vascade L1000 fiber’s large effective area design allows for launching higher optical power in the fiber without significant non-linear penalties. As a result, Vascade L1000 fiber can offer longer reach and higher capacity.

**Vascade® LS+ Fiber**
Vascade LS+ fiber is a non-zero dispersion shifted fiber (NZ-DSF) with negative dispersion and low positive dispersion slope that is optimal for medium distances and wide band wavelength division multiplexed (WDM) systems. Optical dispersion across the entire C-band enables effective dispersion compensation and suppresses non-linear impairments. With low attenuation, dispersion slope, and bend loss, Vascade LS+ fiber delivers high-quality performance.

**Vascade® LEAF® EP Fiber**
Vascade LEAF EP fiber is a NZ-DSF with negative dispersion and positive dispersion slope that offers the advantages of a large effective area; 40 percent larger than typical NZ-DSFs; which increases the amount of optical power the fiber can carry without significant non-linear effects. Like Vascade LS+ fiber, Vascade LEAF fiber is designed to ensure that it can operate over the entire C-band while suppressing non-linear effects.

**Vascade® S1000 Fiber**
Vascade S1000 fiber is Corning’s first dispersion and dispersion slope compensation fiber designed for use in optical transmission cables. It has dispersion designed specifically to match and compensate the dispersion characteristics of Vascade L1000 fiber. Together these fibers are offered as dispersion managed solutions called Vascade® R1000 and Vascade® R2000 fiber solutions.

**Vascade® EX1000 Fiber**
The key attribute of Vascade EX1000 fiber, an ITU-T G.654-compliant fiber, is ultra low attenuation designed to increase reach and reduce network complexity. Vascade EX1000 fiber is one of the best solutions for long unrepeatered submarine systems that need low attenuation characteristics compared to single-mode fiber. In repeatered systems, the low attenuation of Vascade EX1000 fiber allows system designers to compensate higher accumulated dispersion with the same span loss budget.

**Vascade® EX2000 Fiber**
Vascade EX2000 fiber is the latest addition to Corning’s Vascade fiber family. This fiber combines ultra low attenuation with large effective area. The result is higher optical signal to noise ratio (OSNR), a critical requirement of networks operating at very high data rates such as 40 and 100 Gb/s. This fiber is designed for both repeatered and unrepeatered submarine applications.
## Typical values at 1550 nm

<table>
<thead>
<tr>
<th>Description</th>
<th>Vascade® L1000 Fiber</th>
<th>Vascade® LS+ Fiber</th>
<th>Vascade® LEAF® EP Fiber</th>
<th>Vascade® S1000 Fiber</th>
<th>Vascade® EX1000 Fiber</th>
<th>Vascade® EX2000 Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>A high positive dispersion fiber with large effective area</td>
<td>0.187</td>
<td>0.201</td>
<td>0.200</td>
<td>0.235</td>
<td>≤0.174</td>
<td>0.162</td>
</tr>
<tr>
<td>A negative dispersion, NZ-DSF fiber with low, positive dispersion slope</td>
<td>+18.5</td>
<td>-3.0</td>
<td>-4.0</td>
<td>-38.0</td>
<td>+18.5</td>
<td>+20.4</td>
</tr>
<tr>
<td>A negative dispersion, NZ-DSF with large effective area and positive</td>
<td>+0.06</td>
<td>+0.05</td>
<td>+0.12</td>
<td>-0.12</td>
<td>+0.06</td>
<td>+0.06</td>
</tr>
<tr>
<td>A high negative dispersion fiber with negative slope, paired with</td>
<td>100</td>
<td>48</td>
<td>65</td>
<td>27</td>
<td>76</td>
<td>112</td>
</tr>
<tr>
<td>Vascade L1000 fiber to create a dispersion managed fiber solution</td>
<td>≤0.05</td>
<td>≤0.05</td>
<td>≤0.05</td>
<td>≤0.05</td>
<td>≤0.05</td>
<td>≤0.05</td>
</tr>
</tbody>
</table>

### Vascade® Fiber Hybrid Designs

Performance and cost optimization within submarine systems requires careful balancing of fiber attributes. Corning developed the Vascade® fiber portfolio to meet the diverse capacity/reach needs of submarine networks. By combining individual constituent fibers with unique optical and mechanical properties, Corning can meet a wide range of technical system performance specifications. Enhanced performance and cost advantages are achieved by using more than one fiber type in the fiber span as shown below:

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Fiber 1  Splice  Fiber 2
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Corning’s ability to match individual fibers enables precise control of local dispersion, residual dispersion, dispersion slope, attenuation, effective area and length.

### Vascade LEAF EP fiber and Vascade LS+ fiber Solution/Hybrid

The wider system bandwidth required to accommodate the larger number of channels on repeatered submarine systems has increased the importance of minimizing the dispersion slope to ensure good edge channel performance. Vascade LEAF EP fiber is used near the transmitter as it’s large effective area can handle higher optical launch powers. The remainder of the span uses Vascade LS+ fiber to obtain an overall span with a reduced dispersion slope (typically <0.085 ps/nm²/km).
Vascade® R1000 Fiber Solution
Corning's Vascade R1000 dispersion-managed fiber (DMF) solution combines Vascade L1000 and Vascade S1000 fibers in a single-span, offering higher capacity and closer channel spacing than is possible with any other solution. By adjusting the ratio of the constituent fibers, spans of Vascade R1000 fiber solution are manufactured to meet individual customer dispersion requirements. By careful fiber selection, Corning maintains an average dispersion slope that is typically <0.005 ps/nm²/km when the dispersion is compensated back to zero. This is an order of magnitude better than can be achieved using traditional NZ-DSF. The same attributes that maximize system performance also significantly reduce the complexity and cost of terminal dispersion compensation and provide an ideal platform for upgrades to next generation technologies.

Vascade® R2000 Fiber Solution
Corning's Vascade R2000 fiber solution is the next generation of dispersion-managed fiber (DMF) that consists of ultra low attenuation Vascade EX2000 fiber and negative dispersion and dispersion slope Vascade S1000 fibers in a single span. Today, as transmission systems evolve to 40 Gb/s, the requirement for higher optical signal to noise ratio (OSNR) becomes very critical. Corning Vascade R2000 fiber addresses this need by significantly improving large effective area fiber and attenuation in the dispersion managed span. Vascade EX2000 fiber has a very large typical effective area of 112 µm² and typical ultra low attenuation of 0.162 dB/km. The Corning Vascade R2000 fiber solution offers lower span loss and larger span effective area. The Vascade R2000 fiber solution enables transoceanic, high data rate transmission capacity at 40 Gb/s and beyond.

<table>
<thead>
<tr>
<th>Vascade LEAF EP fiber and Vascade LS+ fiber solution/hybrid</th>
<th>Vascade R1000 Fiber Solution</th>
<th>Vascade R2000 Fiber Solution</th>
</tr>
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<tbody>
<tr>
<td>Description</td>
<td>Dispersion-managed solution designed for long distance and high capacity systems, utilizing Vascade L1000 and Vascade S1000 fibers.</td>
<td>Dispersion-managed solution designed for long distance and high capacity systems, utilizing Vascade EX2000 and Vascade S1000 fibers.</td>
</tr>
</tbody>
</table>

How to Order
Contact your sales representative, or call the
Optical Fiber Customer Service Department:
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    +44-1244-287-437 (Europe)
Email: opticalfibcs@corning.com
Please specify the fiber type, attenuation and quantity when ordering.