Draka

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Specialty Fiber

# DrakaElite™ High Temperature Optical Fiber products

**The alliance of state-of-the-art high temperatures coating with Draka glass excellence**


DrakaElite™ is the specialty optical fiber product line of the Prysmian Group. It utilizes the experience of the world wide leader of the cable industry in material for harsh environment and offers a range of state-of-the-art coatings for operations at extreme temperatures.

The range of coatings includes High Temperature Acrylate coating (150℃*), Silicone coating (200℃*) a nd Polyimide coating (300℃*/**). It brings a suite of valuable solution s to the specific needs of any industries; medical, sensor, aerospace as well as oil and gas.

These coatings are associated with Draka brand of optical fiber with decades of proven reliability and leading performances in telecom and datacom solutions.

For specific application these coatings can be combined with Draka's specialized optical fiber including RadHard or SuperRadHard fibers for radiations exposed applications or Draka's HP&HT solutions for resistance under high hydrogen pressure and high temperature environments.

These high temperature fibers can be used in all cable constructions, including loose tube, tight buffered, ribbon and central tube designs.

- * maximun long term operating temperature
- ** also operating at very low temperature

| Features | Advantages |
|---|---|
| High temperature resistant coatings | Supports application in environments with both constant high temperature and fluctuating temperature |
| Industrial process | Superior geometry, uniformity and homogeneity |
| Draka's leadership in telecom and datacom | State-of-the-art transmission performances |
| Innovative glass design | Fiber available with bend insensitive feature |
| Draka's proprietary PCVD process (Plasma activated Chemical Vapor Deposition Process) | Coatings can be combined with radiation hardened or hydrogen tolerant glass structure |

## *Did you know?*

DrakaElite

Prysmian Group is the world wide leader of single mode fibers and multimode fibers for telecom and datacom. DrakaElite, its specialty fiber product line, takes the best of this technology and adds specific building blocks to offer the performance of optical fibers to the most demanding applications. High temperature fibers are an illustration of it; combining top glass performances with the most suitable coating for the environmental conditions.

VALUE INNOVATION

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## Optical fiber selection guide

The first parameter to consider when choosing fiber for harsh environment is obviously the type of technology selected for the application, whether it is **single mode technology** (9 µm nominal core fibers) or **multimode technology** (50 µm and larger core fibers). Single mode fibers are mostly used for communication for multiple kilometer distances, but this technology is also needed in Rayleigh, Acoustic, Raman or Bragg grating based sensing technology. Multimode fibers are used for data transmission on shorter distances (Graded Index Multimode Fibers), power transportation (Step index Multimode Fibers) or Raman based sensing.

For both single mode and multimode fibers, Draka has developed specific trench-assisted lightguide designs that dramatically reduce the optical losses due to macro- or micro- bends, while remaining fully back-ward compatible with existing standards. Known as Draka's **BendBright®** technology, it is especially recommended when tight fiber bends (R ≤ 15 mm) are to be expected. Furthermore, it makes sense in harsh environment in order to protect the optical power budget by reducing the variation of the attenuation with the temperature. Main available products are, for single mode: **BendBright®-XS** and **BendBright®-Elite** and for multimode: **MaxCap®-BendBright®**.

Optical fiber can be as well adapted to other demanding environments. Draka has developed specific optical fiber for radiation exposed applications; **RadHard** fibers for low to medium irradiative environments; **SuperRadHard** fibers for more exposed environments. Draka has as well developed specific optical fiber (**HP&HT** fibers) for high pressure and high temperature environments typically found in gas & oil industries. These fibers offer far lower attenuation increase when exposed to radiation or to high hydrogen pressure.

## Coating selection guide

Despite their high strength, optical fibers require coatings to protect and maintain their intrinsic strength during installation and operation. Draka has developed three coatings for medium high (150℃) to very high (300℃) temperatures, so as to provide t he most appropriate answer for demanding applications.

The high temperature polyacrylate (**HTA**) is able to cope with temperature up to **150℃** on long duration and up to **180℃** short term*. Its other characteristics are very close to those of the urethane acrylate coatings used for the telecom market. Therefore, advantage could be taken of all the techniques developed for this mass deployment market; cable construction and stripping tools included.

The **silicone** coating is capable of **200℃/230℃** , long/short term*. It is easy to strip mechanically, offers very low microbending loss and is resistant to many chemicals.

The **polyimide** coating can cope with very high temperature (**300℃/350℃** , long/short term*). Draka polyimide coating offers top-of-the-art adhesion to the optical fiber surface while being compatible with any polyimide chemical or thermal stripping techniques. It is tough enough to be used in demanding, down hole applications.

*short term: ≤ 3 days

## How can we be of service to you?

Value Innovation is a way of looking at the world. How can we help our customers do more, make more, save more, achieve more? Take DrakaElite™. Based on our proprietary manufacturing process and our control of all technological building blocks, we offer an extensive portfolio of specialized optical fibers that have been designed, developed, manufactured and tested for every environment. Whether you want to guide, amplify, transmit, process, control or sense light, Draka has the fiber you need, whatever your environment. And if for some reason we don't have exactly what you need, well, we'll just make it.

That's Value Innovation in action.


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## High temperatures coating types

| Coating type | Long term temperature range (min / max) | Short term* max temperature | Coating diameter | Attenuation change with temperature (dB/km)** | Stripping |
|---|---|---|---|---|---|
| High Temperature Acrylate (HTA) | -60℃ / +150℃ | 180 ℃ | 242 ± 7 µm | single mode: ≤ 0.05<br>multimode: ≤ 0.05 | Any methods |
| Silicone** | -60℃ / +200℃ | 230°C | 242 ± 15 µm | single mode: ≤ 0.3<br>multimode: ≤ 0.3 | Mechanical stripping |
| Polyimide** | -60℃ / +300℃ | 350 ℃ | 155 ± 5 µm | single mode: ≤ 0.05<br>multimode: ≤ 0.05 | Thermal or chemical stripping |

* short term: ≤ 3 days

** typical max induced attenuation at 1310 and 1550 nm (single mode) or at 850 nm multimode, after 3000 h, at the highest temperature of the long term temperature range

## Single Mode Fibers (1) (2)

| Type *(ITU-T recommendation)* | Operational wavelengths | Attenuation with bending** | Coating | Attenuation (dB/km) 1310 -1625 nm | Attenuation at 1550 nm (dB/km) |
|---|---|---|---|---|---|
| SMF *(G.652)* | 1260 nm -1625 nm | Not specified at low radius | HTA:<br>Silicone:<br>Polyimide: | ≤ 0.4<br>≤ 0.4<br>≤ 0.7 | ≤ 0.3<br>≤ 0.3<br>≤ 0.6 |
| BendBright*-XS *bend-insensitive fiber (G.657.A2)* | 1260 nm -1625 nm | R=7.5 mm: ≤ 0.1 dB | HTA:<br>Silicone:<br>Polyimide: | ≤ 0.4<br>≤ 0.4<br>≤ 0.7 | ≤ 0.3<br>≤ 0.3<br>≤ 0.6 |
| BendBright*-Elite *Ultra bend-insensitive (G.657.B3)* | 1260 nm -1625 nm | R=5 mm: ≤ 0.1 dB | HTA:<br>Silicone:<br>Polyimide: | ≤ 0.4<br>≤ 0.4<br>≤ 0.7 | ≤ 0.3<br>≤ 0.3<br>≤ 0.6 |

* BendBright is a registered trade mark of Draka

** at 1550 nm, 1 full turn

## Graded Index Multimode Fibers (1) (2)

| Type (core/clad diameter, µm) | Operational wavelengths | Numerical aperture | OFL bandwidth (MHz.km) | Attenuation | Attenuation with bending** |
|---|---|---|---|---|---|
| 50 µm GI-MMF (50/125) | 850 – 1300 nm | 0.20 ± 0.02 | ≥500 to ≥3500 at 850 nm | ≤ 3.0 dB/km at 850 nm | Not specified at low radius |
| 50 µm BI* GI-MMF (50/125) | 850 – 1300 nm | 0.20 ± 0.02 | ≥500 to ≥3500 at 850 nm | ≤ 3.0 dB/km at 850 nm | ≤ 0.2 dB at 850 nm<br>2 turns, R=7.5 mm |
| 62.5 BI* GI-MMF (62.5/125) | 850 – 1300 nm | 0.28 ± 0.02 | ≥500 at 1300 nm | ≤ 1.0 dB/km at 1300 nm | ≤ 0.6 dB at 1300 nm<br>2 turns, R=7.5 mm |

* BI: Bend Insensitive

## Step Index Multimode Fibers (1) (2)

| core/clad diameter, µm | Operational wavelengths | Numerical aperture | Attenuation* (850 nm) | Attenuation* (1300 nm) | Notes |
|---|---|---|---|---|---|
| 50/125 low NA | 650 – 1300 nm | 0.12 ± 0.02 | ≤ 20 dB/km | ≤ 10 dB/km | |
| 50/125 medium NA | 650 – 1300 nm | 0.22 ± 0.02 | ≤ 6 dB/km | ≤ 3 dB/km | |
| 62.5/125 | 650 – 1300 nm | 0.29 ± 0.02 | ≤ 6 dB/km | ≤ 3 dB/km | |
| 105/125 low NA | 650 – 1300 nm | 0.15 ± 0.02 | ≤ 20 dB/km | Upon request | |
| 105/125 medium NA | 650 – 1300 nm | 0.22 ± 0.02 | ≤ 12 dB/km | Upon request | |

* for HTA and silicone, PI under development

(1) **glass and coating combinations availability is volume dependant, please contact us for further details**

(2) **other cladding dimensions upon request**

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## Radiation Hardened Single Mode Fibers (1)

| Type | Operational wavelengths | Radiations | Coating | Attenuation at 1310 nm (dB/km) | Attenuation at 1550 nm (dB/km) |
|---|---|---|---|---|---|
| RadHard SMF | 1260 nm -1625 nm | << 100 Gy | HTA: | ≤ 0.4 | ≤ 0.3 |
| SuperRadHard SMF | 1260 nm -1625 nm | > 100 Gy | HTA:<br>Silicone:<br>Polyimide: | ≤ 0.5<br>≤ 0.5<br>≤ 0.8 | ≤ 0.4<br>≤ 0.4<br>≤ 0.7 |

## Radiation Hardened Gradient Index Multimode Fibers (1)

| Type (core/clad diameter, µm) | Operational wavelengths | Radiations | Numerical aperture | OFL bandwidth (MHz.km) | Attenuation |
|---|---|---|---|---|---|
| RadHard MMF* (50/125) | 850 – 1300 nm | << 100 Gy | 0.200 ± 0.015 | ≥500 to ≥3500 at 850 nm | ≤ 3.0 dB/km at 850 nm |
| RadHard MMF* (62.5/125) | 850 – 1300 nm | << 100 Gy | 0.28 ± 0.02 | ≥500 at 1300 nm | ≤ 1.0 dB/km at 1300 nm |
| SuperRadHard MMF (50/125) | 850 – 1300 nm | > 100 Gy | 0.200 ± 0.015 | ≥500 at 850 and 1300 nm | ≤ 3.0 dB/km at 850 nm |

* Only available with HTA

## Hydrogen Tolerant High Pressure and High Temperature Single Mode Fibers (1)

| Type *(ITU-T recommendation)* | Operational wavelengths | Coating | Attenuation at 1310 nm (dB/km) | Attenuation at 1550 nm (dB/km) | note |
|---|---|---|---|---|---|
| HP&HT SMF | 1260 nm -1625 nm | HTA:<br>Silicone:<br>Polyimide: | ≤ 0.5<br>≤ 0.5<br>≤ 0.8 | ≤ 0.4<br>≤ 0.4<br>≤ 0.7 | HP&HT150 SMF<br>HP&HT200 SMF<br>HP&HT300 SMF |

## Hydrogen Tolerant High Pressure and High Temperature Graded Index Multimode Fibers (1)

| Type (core/clad diameter, µm) | Operational wavelengths | Numerical aperture | OFL bandwidth (MHz.km) | Attenuation | note |
|---|---|---|---|---|---|
| HP&HT GIMMF (50/125) | 850 – 1300 nm | 0.200 ± 0.015 | ≥500 at 850 and 1300 nm | ≤ 3.0 dB/km at 850 nm | HP&HT150 MMF<br>HP&HT200 MMF<br>HP&HT300 MMF |

## Common Specifications - mechanical specifications

| Characteristics | Conditions | Specified Values | Units |
|---|---|---|---|
| Proof Test | Off-line, standard | > 0.69 (100) | GPa (kpsi) |
| | Off-line, upon request | > 1.4 (200) | GPa (kpsi) |
| Dynamic Tensile Strength (median value) | 0.5 meter gauge length, unaged and aged* | > 3.8 (550) | GPa (kpsi) |
| Fatigue Parameter (Typical) | Dynamic fatigue, unaged and aged* | $n_d$ > 18 | |

* aged: 1000 hours at max long term temperature

**(1) glass and coating combinations availability is volume dependant, please contact us for further details**

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