BendBright^{XS}

Powering digital transformation with bend-insensitive fibre optic cables

Introduction:
Excellence in optical infrastructure is crucial

i. What is bend-insensitivity?

ii. Why bend-insensitive fibre?
Future-proofing today's networks

Prysmian Group's cabling solutions

Conclusion

Prysmian General Cable Draka

Excellence in optical infrastructure is crucial

5G IoT AI

We're living in a time of technological transformation. As new technologies such as 5G, IoT, and Artificial Intelligence evolve, our optical networks must quickly adapt to meet new demands: for increased capacity, higher density and lower latency.

Over the last 30 years, fibre optic cabling has evolved to support our new era of hyper-connectivity, linking continents, countries, cities, antennas and homes. And that isn't set to change. In 2018, more than 550 million kilometres of fibre were installed globally, compared with just 200 million kilometres in 2010. This exponential market growth is expected to continue with the invention and adoption of new technologies, driving us into a new era of digital demand.

Artificial intelligence is unlocking creative freedom in our workplaces. Augmented reality is amplifying our everyday world. Edge computing is connecting families, businesses, and allies across the globe – all with increasing speed. To support the evolution of these new technologies, it's crucial that we increase the capacity of the optical network.

As a result, network access layers will push fibre deeper towards the consumer to provide power to edge devices, while wireless and wireline networks will converge. New cabling systems with a high degree of fibre density will offer a faster, more reliable, more cost-effective solution. And further change will come from cables which can support a complete open fibre spectrum: from 1260 nm at the beginning of the Original O-band, up to 1625 and 1675 nm at the ends of the Long L-band and Ultralong U-band, respectively. These cables must be able to support data transmission and offer monitoring capabilities.

Bend-insensitive fibre optic cables are a crucial part of the world's shift towards flexible and reliable connectivity. With their extreme fibre count and reduced diameter, they also make installation faster and more cost effective.

Prysmian's BendBright^{XS} fibres are capable of providing the necessary standard of cable density, and of supporting the necessary fibre spectrum demanded by new PON technologies. They minimise losses which are linked to macro- and microbends, optimise operational costs and increase network lifespan thanks to higher repair resilience. This is a data transmission solution which will enable a safe, connected, powered future for everyone.

Reliable connectivity

Reduced diameter

Faster installation

Cost effective

What is bend-insensitivity?

There are two types of bend-insensitivity:

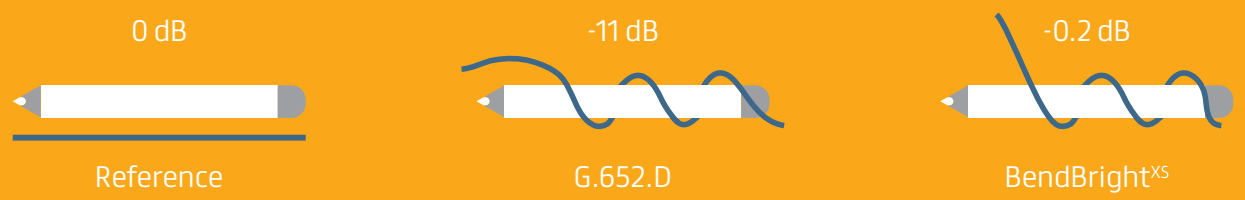
Millimetre-range macrobend-insensitivity

Macrobends are visible to the naked eye, such as fibre cabling which bends around corners, inside splicing closures and within connectivity devices. Macrobending is especially likely to occur within high-density networks, as space is limited to route and accommodate fibres within connectivity devices.

Micrometre-range microbend-insensitivity

Microbends refer to microscopic local effects on a cable – for example, cable material squeezing the fibre. Such bends can occur due to the cable's reduced diameter, or because the cable has been squeezed by external pressure – common over the long life-cycle of a cable. Microbends can also occur during temperature variations, which can induce material shrinkage.

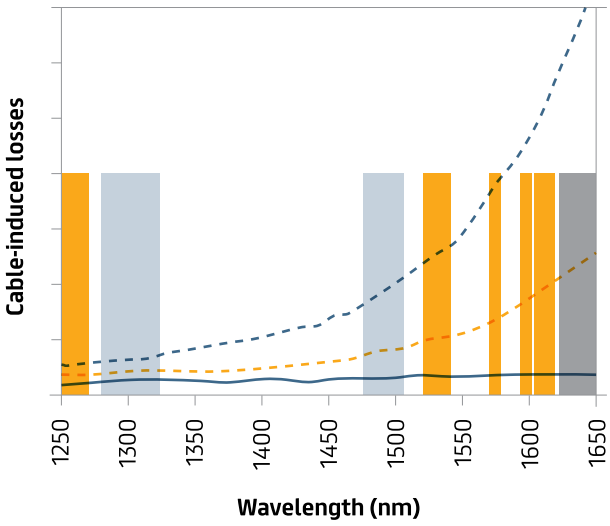
Microbending is especially likely to occur within high-density cables, as fibres can touch due to material shrinkage or other strain. While BendBright^{XS} fibres were initially developed with macrobend-insensitivity in mind, they also outperform all other existing fibre types for microbend-insensitivity.



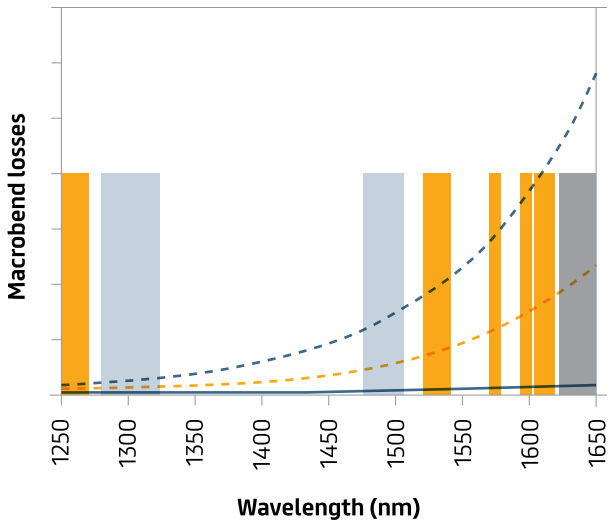
Macrobending loss induced by 2 turns around a pencil

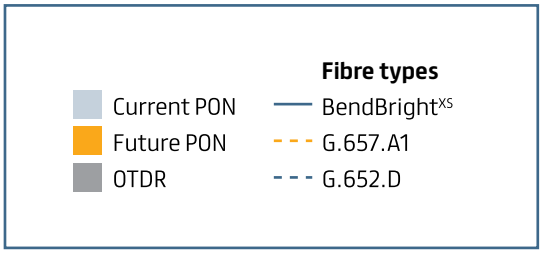
Pencil Testing: A bend-insensitive BendBright^{XS} G.657.A2 fibre patchcord loses only 0.2 dB when twisted twice around a pencil, whereas a 'regular' fibre loses more than 11 dB

Microbend loss



Macrobend loss





Bend-insensitive fibres significantly reduce microbend and macrobend losses across the entire wavelength spectrum used by current and future PON.

Why bend-insensitive fibre? Future-proofing today's networks

Bend-insensitive fibre's resilience gives manufacturers the ability to design cabling solutions which were previously impossible to create, but are now demanded by today's rapidly changing environments.

BendBright^{XS} fibres support the full use of transmission bands, covering the entire wavelength spectrum: from 1260 nm to 1625 nm for data transmission, and up to 1675 nm for network monitoring. This is particularly important when future-proofing higher capacity networks, which will likely operate outside of present standard ranges.

Naturally, such cabling solutions are also beneficial for optimising network operators' Total Cost of Ownership (TCO), making networks quicker and easier to install. Plus, they will stay ahead of the competition when it comes to being 'future-fit'.

As our demand for information continues to increase, fibre networks are becoming more dynamic, crowded, and limited for space. All of this sees fibre bends becoming more likely to occur. Preventing power leakage due to bending effects is therefore a crucial component of high-performing optical networks.

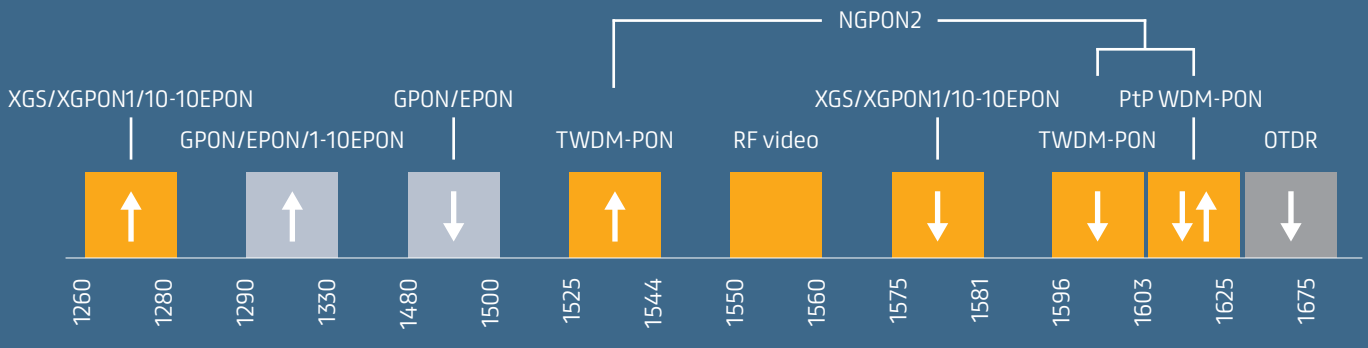
Support PON Evolution and Full Optical Spectrum

High-capacity networks expanded beyond standard wavelength ranges

Optimised Total Cost of Ownership

Prevents bend-induced power leakage and failures

The increasing wavelength requirements of Passive Optical Networks



Bend resistance allows the use of smaller loop guides upon installation and reduces the bend radius of splice trays: connectivity devices become smaller, saving even more invaluable space. And in dynamic network environments, bend resistance extends the expected network lifetime by improving repair resilience.

Next-generation WDM-PON drives the need for bend-insensitive fibres as part of FTTx and 5G mobile networks. But fibre optic networks are a long-term investment and solutions must be considered carefully. BendBright^{XS} cabling systems' broad-spectrum transmission, small diameter, and 'pay-as-you-grow ' potential are what make them the ideal, future-fit solution. With their preservation of system power budgets – even when installed by less-practiced technicians – the use of cables with BendBright^{XS} is an opportunity for significant OPEX savings.

Smaller connectivity devices

Improved repair resilience

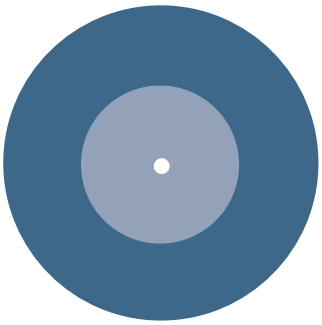
Pay-as-you-grow

OPEX savings thanks to easy installation and superior robustness

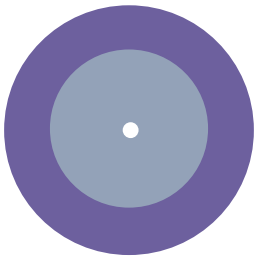
In 2006, Prysmian introduced BendBright^{XS}, the first ever-commercialised bend-insensitive G.657 fibre fully compatible with legacy G.652.D fibres, and with regular 250 µm coating diameter. Then, in 2009, Prysmian introduced BendBright^{XS} 200 µm, especially designed for high density access networks. BendBright^{XS} with 200 µm coating diameter (instead of regular 250 µm) offers the possibility to strongly reduce cable diameters. Reduced-diameter fibres have opened an innovative gateway for many new cable systems applicable to a variety of network configurations.

One decade later, Prysmian introduced the world 's first 180 µm-coated fibre. BendBright^{XS} 180 µm pushes dimensions to an unprecedented lower level and enables cable systems with extreme fibre density. The dimensional reduction corresponds to half of the cross-section area of legacy 250 µm single-mode fibres while preserving a 125µm glass diameter. BendBright^{XS} 180 µm is fully compliant with ITU -T G.652.D and G.657.A2 international recommendations, and it can be spliced with legacy 250 µm single-mode fibre.

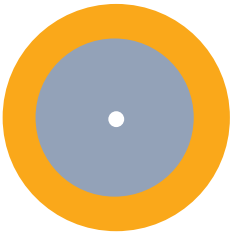
BB-XS 250 µm



BB-XS 200 µm



BB-XS 180 µm



Prysmian Group's high density cabling solutions

FlexTube®

Flexible, easy hand ability micro-modules with maximised fibre count, reduced diameter and weight

Pay-as-you-grow model through combination of microducts

Fast access to fibres with no tools required, for lower installation costs

Ideal for access networks in densely populated metropolitan areas and hyper-scale data centres

Extreme density structures with up to 2,112 fibres

FlexRibbon™

Lightweight, gel-free, kink resistant cable – easier to route and to accommodate in splicing closures

Ribbon technology for faster splicing time and lower installation costs

Optimised for access networks and hyper-scale data centre interconnect

Double the fibre density in fixed-diameter ducts, fitting 3,456 fibres into 1.5" ducts

Extreme density structures with up to 6,912 fibres

Microduct cables

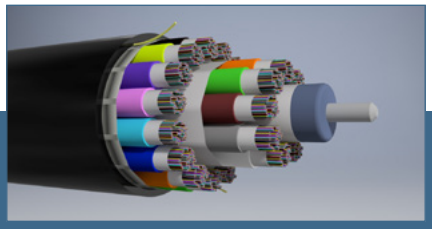
Small diameter cables which maximise microduct utilisation

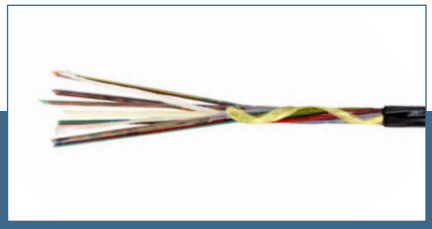
Optimised jetting performance in underground installation and over existing cables

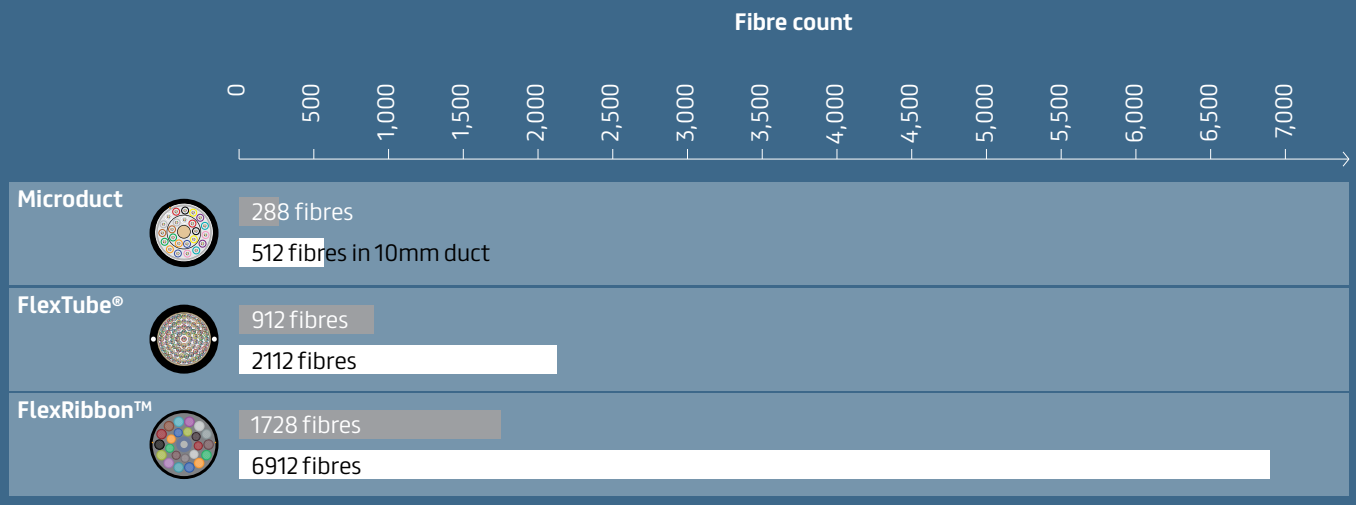
Scalable solution with pay-as-you-grow model, reducing upgrade costs

Connectivity devices benefit from reduced volume and increased reliability

Novel cable systems with more than 500 fibres in a 10mm microduct





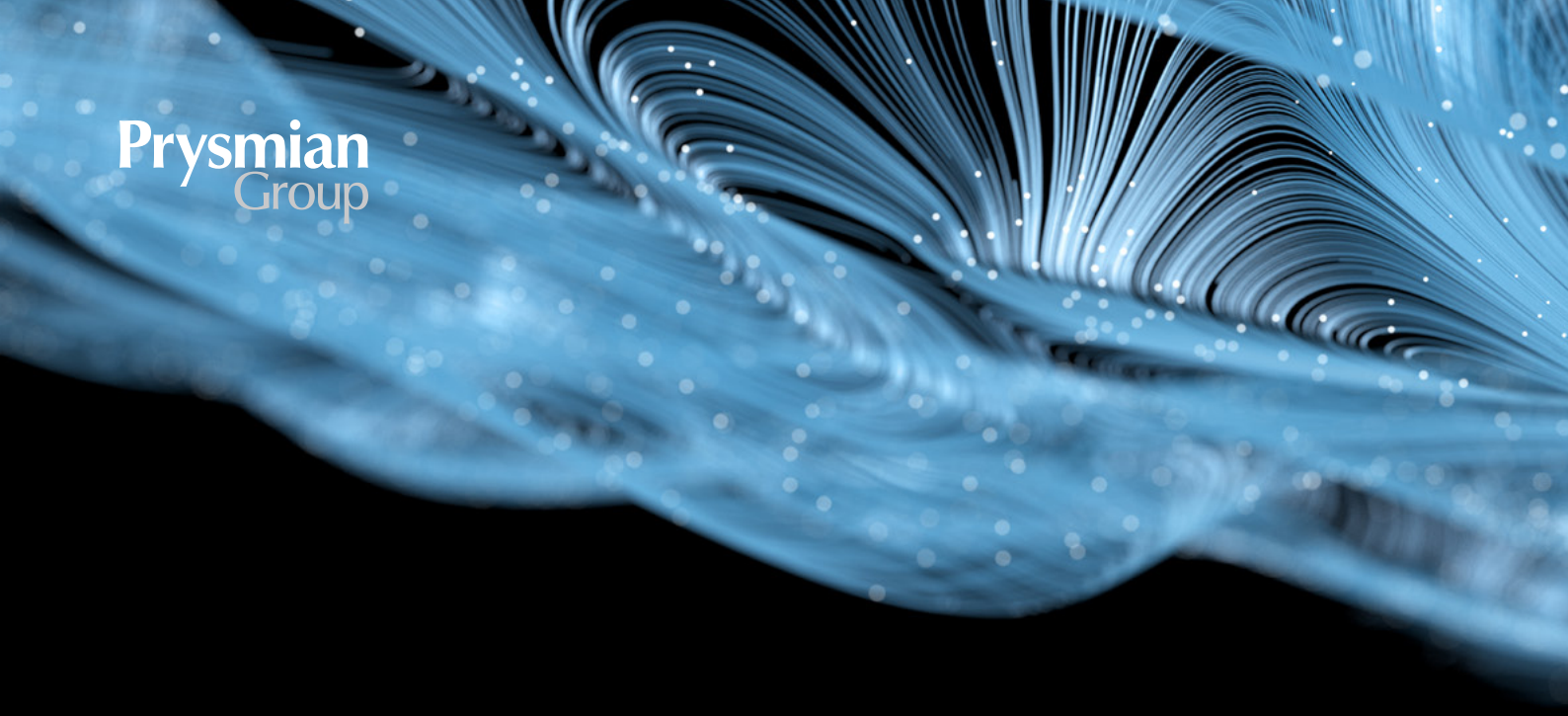


Systems evolutions

Hundreds of millions of kilometres of fibre are deployed each year to support the bandwidth demand of end users. The load placed on PON networks will see our networks' gradual evolution to 10 Gbps and beyond over the next decade.

As 5G grows and more antennas are deployed, WDM optics will also be required to manage system congestion. The long lifecycle of access infrastructure requires PON systems to be backwards compatible, requiring new, longer-wavelength windows to be lit. OTDR testing and monitoring signals will then be pushed up into the 1 650 nm range, where cable constraints become critical.

There is one solution: deploying truly bend-insensitive BendBright^{XS} cable systems that secure all frequency bands. Operators who choose BendBright^{XS} cable systems will secure maximum potential from their optical networks.



Conclusion

Global connectivity is of critical economic and social importance. Network operators must act today to support the worldwide demand of tomorrow.

At Prysmian, we developed access network optimised cable systems built on BendBright^{XS} fibre technology so we could provide a scalable solution for our customers: one that's high-density, physically compact, and easily deployable for a future-fit solution.

Prysmian has a reputation for developing and manufacturing world-leading optical fibre and fibre cables. We've partnered with major telecoms operators, cable TV operators and Over-the-Top service providers across the world, supplying them with the perfect cabling solutions for their needs.

Ready to power the world of tomorrow, today?

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