WHITE PAPER

THE NEW BEND-OPTIMIZED SINGLE-MODE G.652.D (BLO) FIBRE ELIMINATES COMPATIBILITY PROBLEMS IN ALL NETWORK TYPES

Datwyler has gradually been replacing the bend-optimized single-mode fibre conforming to standard G.657.A1 with a new bend-optimized state-of-the-art fibre. The new single-mode fibre, designated G.652.D (BLO) – Bend Losses Optimized – is innovative in that it combines the benefits of G.652.D and G.657.A1, the two previous fibre types. It is also fully compatible with Datwyler's existing standard single-mode G.652.D fibre.

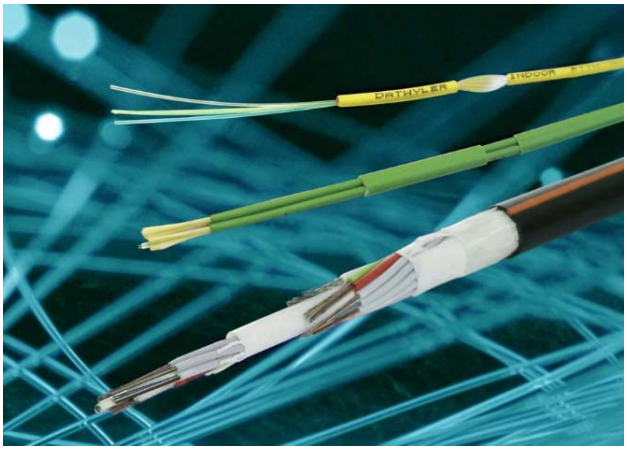
Since the beginning of 2016 Datwyler Cabling Solutions has been using the new bend-optimized single-mode G.652.D (BLO) fibre to manufacture fibre optic (FO) cables in the full range of products which until then had included the bend-insensitive single-mode G.657.A1 fibre as standard. This covers the company's FO Indoor, FO Universal and FO Outdoor cables, to which use of the new type of fibre gives an additional margin of safety.

Splice losses due to different mode field diameters

Until now, the use of bend-insensitive single-mode fibres has always involved the following compromise: In the interest of smaller bending radii a smaller mode field diameter of 8.6 µm +/- 0.4 at 1310 nm had to be accepted for the G.657.A1 fibre as opposed to the mode field diameter of the G.652.D fibre (9.2 µm +/- 0.4 at 1310 nm).

As long as only one and the same type of optical fibre was used in a fibre optic network there were no restrictions at all. However, the bend-insensitive G.657.A1 fibre is more expensive than the G.652.D, which tended to discourage its use on long, high-fibre links and in ducted fibre optic systems.

Therefore, cables with both fibre types were often used in the same network. Wherever there was a transition



from one type of fibre to the other the slight difference in mode field diameter caused higher splice losses, and jumps in attenuation (gainer/loser problems) could occur.

Fully compatible with G.652.D

The newly introduced G.652.D (BLO) fibre with 9.2 µm +/- 0.4 at 1310 nm now has exactly the same mode field diameter as the Datwyler G.652.D fibre. This means that the previously limited compatibility of the slightly different mode field diameters is now re- placed by full compatibility between the G.652.D fibre and the bend-optimized G.652.D (BLO) fibre, and splice loss is reduced.

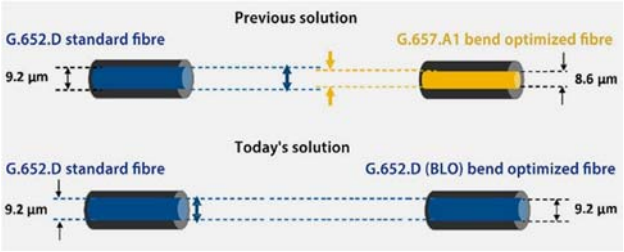


Figure 1: Even when precisely aligned, light is lost when G.652.D is connected to G.657.A1. This no longer happens with the new bend-optimized G.652.D (BLO) fibre.

Fibre attenuation in the G.652.D (BLO) fibre has also been optimized. It is consistent with the fibre attenuation of the Datwyler bend-sensitive G.652.D fibre (see Table 1). Image mapping and planning are simplified by the now harmonised backscatter behaviour.

Max. attenuation values "cabled"	Datwyler G.652.D (BLO)	Dätwyler G.652.D
Attenuation @1310 nm	≤ 0.34 dB/km	≤ 0.34 dB/km
Attenuation @1383 ± 3 nm	≤ 0.34 dB/km	≤ 0.34 dB/km
Attenuation @ 1550 nm	≤ 0.21 dB/km	≤ 0.21 dB/km
Attenuation @ 1625 nm	≤ 0.23 dB/km	≤ 0.23 dB/km

Table 1: The maximum kilometric fibre attenuation of the Datwyler G.652.D and G.652.D (BLO) fibres (cabled) is the same.

Bending performance as defined in ITU-T G.657.A1

What had not been managed thus far but has been achieved by Datwyler's new fibre range is to combine outstanding bend performance conforming to standard ITU-T G.657.A1 with the aforementioned benefits. The induced bending losses for the G.652.D (BLO) fibre are defined as follows:

Induced bending loss per instance of bending	Datwyler G.652.D (BLO)	ITU-T G.657.A1
1 winding x 10 mm radius @1550 nm	≤ 0.50 dB	≤ 0.75 dB
1 winding x 10 mm radius @1625 nm	≤ 1.5 dB	≤ 1.5 dB
10 windings x 15 mm radius @1550 nm	≤ 0.05 dB	≤ 0.25 dB
10 windings x 15 mm radius @1625 nm	≤ 0.30 dB	≤ 1.0 dB

Table 2: The induced bending losses are specified in conformity with ITU-T G.657.A1 and provide considerable safety margins at the maximum permissible limit values.

Origin of the fibre designation

The "BLO" designation of the new state-of-the-art fibre originated from the advantages listed above. The fibres are bend-optimized as well as loss-optimized – due to improved kilometric fibre attenuation – giving the fibre the designation "G.652.D (BLO)", where "BLO" stands for "Bend Losses Optimized".

In using the term "G.652.D" Datwyler takes account of the fact that the specification of mode field diameter and kilometric cabled fibre attenuation are exactly the same as in the bend-sensitive G.652.D fibre.

Excellent tested processing

Owing to the very similar fibre characteristics of G.652.D (BLO) and G.652.D fibres, the G.652.D (BLO) fibre can be spliced swiftly and precisely using a traditional G.652.D single-mode fibre splicing scheme with sheath centering or core centering.

Trouble-free processing was extensively tested by Datwyler in-house. The feedback of customers already using the state-of-the-art fibre confirms our test results.

Increased safety margin

With all the advantages and optimisations listed, the G.652.D (BLO) fibre is clearly superior to the G.657.A1 fibre – and a trendsetter in the field of bend-insensitive single-mode fibres.

The adapted mode field diameter now makes it ideally suited to single-mode applications in data centres. But its bend insensitivity also makes the G.652.D (BLO) more suitable for many established applications than traditional, bend-sensitive fibres.

The higher safety margins are advantageous in the installation and operation of all types of network and in semi-stationary applications – for example, fibre optic patch cables.

