GigaLine® – enhanced fibre optic technology

The increasing degree of automation in industry and the rising information density in office communication make increasing demands on the transmission of analog and digital data. Conventional links based on copper cables are now often reaching the limits of their capacity. The problems caused by electromagnetic effects, differences in potential and operation in explosive environments require technical and economical solutions.
The use of GigaLine® fibre optic cables solves these problems more reliably than the use of conventional copper cables.

The special advantages of GigaLine® fibre optic cables make them suitable in the following cases:

- When electromagnetic effects can occur
- When reliable potential separation is required
- When low attenuation and thus long channels are necessary
- When crosstalk must not occur.
- When sparks must not form (for explosive environments)
- When low weight and small dimensions are an advantage
- When increase security against tapping is required

KERPEN GigaLine® means a comprehensive delivery program for fibre optic cables for virtually all applications.

Besides easy-to-assemble internal cables with compact wire technology for the patch and floor area, universal cables for the backbone indoors and outdoors and the classical outdoor cables for LAN/MAN and WAN, KERPEN offers manufacturing options for a large number of additional designs such as GigaLine® outdoor cables with a corrugated steel sheath, a steel band or SWA armour or with an additional lead covering as a protection against chemicals.

Gigabit and 10Gigabit Ethernet: new demands on the quality of the fibre optic cabling

Improved multimode fibres for Gigabit Ethernet ("OM2e")

Gigabit Ethernet in the backbone of structured in-house cabling is now often a reality or is soon to be implemented. The corresponding standard IEEE 802.3z was made official as early as July 1998.

As a consequence of the requirements this entails, since the beginning of this year GigaLine® has been delivered with improved multimode fibres. The process used to manufacture the fibres has been optimised in such a way that the profile of the multimode fibre is extremely precise and disturbances in the fibre core are virtually eliminated. As differential mode delay does not occur under these circumstances, mode-conditioning patch cords are not necessary.

For more than five years now, the standard versions of GigaLine® fibre optic cables with an improved multimode fibre G50/125 have provided bandwidth/distance products of 600 MHz x km in the first window and 1,200 MHz x km in the second window as well as Gigabit Ethernet segment lengths of 750 / 2,000 m.

Improved multimode fibres for 10 Gigabit Ethernet (OM3, "OM3e")

Just a few months after publication of this standard, IEEE started work on the next stage of development with a higher speed: 10 Gigabit Ethernet.

The draft of this new 10 Gigabit Ethernet standard was ratified as early as June 2002. The official standard was also published by the IEEE in autumn 2002.

The development of a 50 μm multimode fibre for 10 GbE applications up to 300 m and optimised for 850 nm lasers was also successful. This type of fibre was not only given a standard of its own (OM3) in the 2nd Edition of the cabling standard EN 50173 – it was also included in the GigaLine® product program as early as spring 2002.

However, development continues even with the newly developed OM3 fibre. In many cases, the distances to be bridged in the backbone exceed the 300 m possible with a standard OM3 fibre. For this field of application, KERPEN has been offering GigaLine® fibre optic cables with further improved "OM3e" fibres since November 2002. These fibres offer optimum conditions for transmitting 10 GbE at segment lengths of up to 550 m. This allows the economical implementation of 10 GbE in the backbone of a building in virtually all possible cases.

Improved single-mode fibres for increased transmission capacity ("OS1e"/OS2)

In order to bridge even longer distances, since November 2003 KERPEN has complemented the GigaLine® fibre optic cables with high-quality multimode fibres of the categories "OM2e", OM3 and "OM3e" by also offering GigaLine® cables with improved single-mode fibres of the category "OS1e".

Besides the maximum possible 10 Gigabit Ethernet segment lengths of 10 / 40 km, KERPEN GigaLine® cables with "OS1e" fibres also offer an increased transmission capacity via a higher maximum degree of utilisation of the fibre.

This higher maximum degree of utilisation of the "OS1e" fibre is achieved by reducing the OH peak usual for single-mode fibres up to now, an attenuation peak at 1,383 nm.

Typical attennation curve
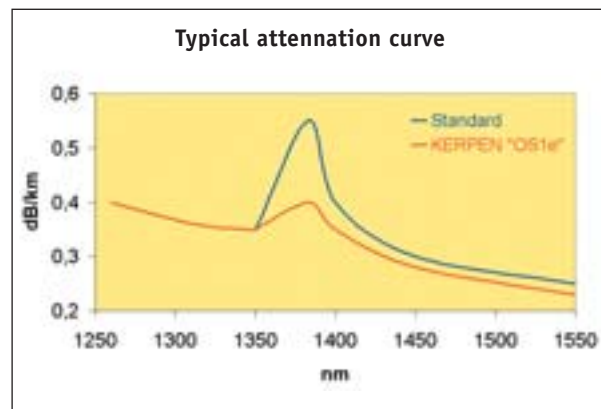
These fibres allow the use of CWDM (Coarse Wavelength Division Multiplex), a method for the parallel transmission of different wavelengths with a channel separation of 20 nm in the so-called E band (1,360 – 1,460 nm).

The minimum demands made on these improved single-mode fibres with a reduced OH peak are defined in IEC 60793-2-50 B1.3 / ITU G.652.C/G.652.D (International Telecommunication Union). Among other requirements, the fibre attenuation must be < 0.4 dB/km over the entire wavelength range.

With attenuation values of 0.36 dB/km at 1,310 nm and 0.22 dB/km at 1550 nm, KERPEN GigaLine® cables with "OS1e" fibres are far below these maximum values. Thus, at 1550 nm these fibres also provide a more than 10 % longer range than the standard fibres used up to now.

Even today, the KERPEN "OS1e" fibre quality meets the requirements discussed in the draft standards prEN50173 for the future definition of an OS2 fibre.

Conclusion:

The control of the data flows of the future therefore requires maximum care in the planning and execution of the passive network infrastructure. One important aspect here is the selection of the suitable fibre type and quality!

Subject to printing errors, mistakes and technical changes.