




Be ready for the future: Draka Datacom Solution

Modern networks face stiff demands. They must be fast and reliable, resist fire and not interfere with other equipment.

UC FIBRE

Optical Fibre Cable – a fast, reliable and always available part of the **Draka Datacom Solution**

Draka

Application of UC^FIBRE

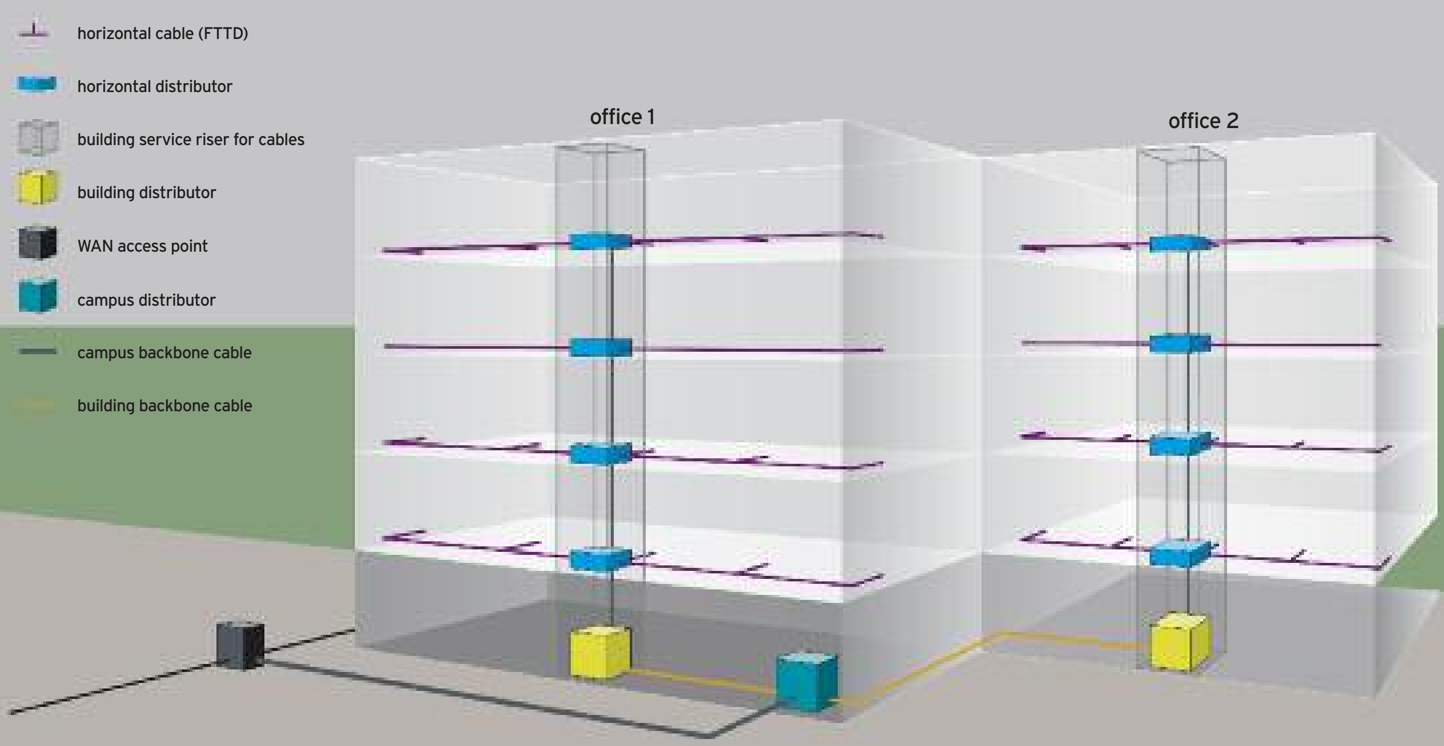
LAN

When it comes to data transmission cables, more and more users decide for fibre technology. It is the undisputed number one in today's Local Area Networks (LAN) – structured cabling in campus and riser networks. There is a trend to Fibre-to-the-desk, e.g. optical fibre cables in horizontal networks.

The decision to use either fibre optic or copper data cables as an ideal solution for horizontal networks depends on many factors like application environment, previous network basis and future needs.

Whatever you decide for, with fibre optic data cables of the UC^FIBRE series – specifically designed to meet the requirements of all structural levels of local networks – you are on the safe side for the future.

Transmission rates are developing exponentially. New transmission protocols follow in ever shorter periods of time. The present standard is 10 Gigabit Ethernet with ten billion bits per second (10Gbit/s). With its outstanding transmission performance, fibre optic cables of Draka Communications provide the ideal basis for the application of future transmission protocols.



Data Centre

Every data centre is a unique structure. There are various segments of different requirements which need to be understood before creating any solution.

Data centre backbones are already equipped with optical fibre technology. It is state-of-the-art and offers lowest attenuation at highest data rates which is a prerequisite for backbone data links. With data centres it forms one of the most demanded components due to the highly aggregated data traffic there.

As soon as 10 Gigabit Ethernet comes to the agenda at Client level, a data centre backbone capable of 10GbE to link between Access and Distribution level turns into a real bottleneck. Despite the fact that copper data cables are capable of covering a distance of up to 100m at 10Gbit/s, the preference in this place should be laser optimized multimode fibre according to OM3 specification. Today's recommendation is clearly to take this future proof solution which is the only short-link technology that is also part of the 40 Gigabit Ethernet and likewise 100GbE development program, which will be based on multi lane structures of OM3 channel links. A data centre backbone in OM3 can therefore be easily expanded to the Next Generation Ethernet and secures investments for a longer pack-off time.

Draka's patented PCVD fibre manufacturing technology enables high-precision refractive index profiles which are the key to laser launched high-speed links. This makes the difference between MaxCap300 exceeding by far OM3 specifications and traditional multimode fibres like OM1 and OM2.

This fibre technology is available in Draka cable designs to meet the specific needs of data centre infrastructures, let it be a single core cable or the popular shotgun cable design with figure-8 shape, the break-out cable for multiple fan outs or loose tube cable design with high fibre counts for trunk lines.

More and more in use is the MPO-style optical fibre connector, which requires small cables to fit the planar structure of its fibre management as well as its outer dimensions. Draka's specifically designed MPO cable is made for interconnects of 40GBase-SR4 channels which is one of the next options into a data centre's infrastructure of the future.

Industry

Ethernet – the classic office application – is increasingly accepted also in industrial automation. In addition to bus solutions still to be encountered, Ethernet makes it possible to manage communication. It is possible to selectively access every single point in the network which makes adjustments and modifications much easier and in the end leads to a reduction of idle times and an increase in productivity.
Fibre optic cables of series UC[FIBRE] are the first choice for Ethernet in a rough industrial environment. Here the cables prove their superiority as to mechanical, chemical and climatic capacity – and, of course, you don't have to care about electromagnetic interferences.

International Standards

ISO/IEC 11801 (2002)
Generic cabling for customer premises
ISO/IEC 24702 (2005)
Generic cabling systems – Industrial premises
ISO/IEC 15018 (2005)
Generic cabling systems – Residential premises

European Standards

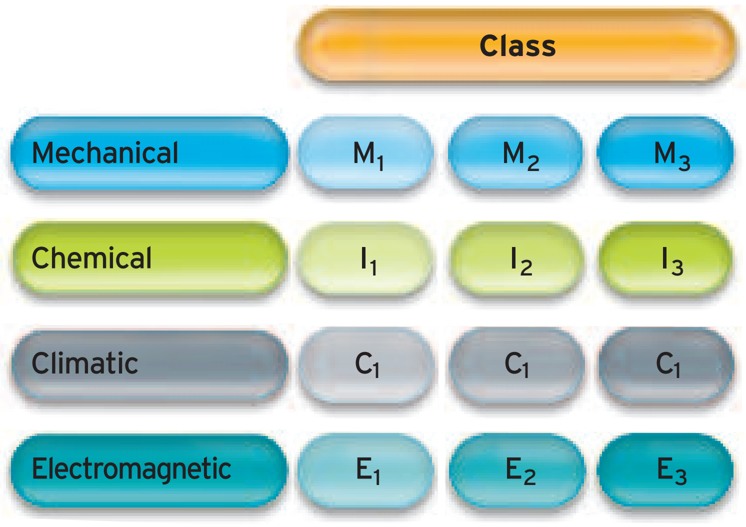
EN 50173-1 Generic cabling systems
- General requirements
EN 50173-2 Generic cabling systems
- Office premises
EN 50173-3 Generic cabling systems
- Industrial premises
EN 50173-4 Generic cabling systems
- Residential premises
EN 50173-5 Generic cabling systems
- Data centres

Ethernet Applications at 850 nm

	OM4* MaxCap 550 50 μm 10G / 550m	OM3 MaxCap 300 50 μm 10G / 300m	OM2 50 μm 500 / 500 MHz.km	OM1 62.5 μm 200 / 500 MHz.km
40Gb/s (40GBASE-SR4)	300 m**	100 m	-	-
10Gb/s (10GBASE-SR)	550 m	300 m	86 m	33 m
1Gb/s (1000BASE-SX)	1100 m	900 m	550 m	275 m

Table 1: Ethernet applications and permissible channel lengths with MaxCap multimode fibre

*) = draft IEC standard
**) = future IEEE work item



Mice Matrix

MICE is the heading under which the demands for wiring are covered in standardization. Herewith a set of requirements is defined which consists of mechanical (M), chemical ingress (I), climatic (C) and electromagnetic (E) components. These requirements address different environments which are distinguished in three classes:
Office, Light Industry, Heavy Industry

Optical fibre principle

Utmost accuracy during the manufacturing process – this is the "secret" of a high-capacity optical fibre. Only top quality permits an optimum data transmission – especially in the new high-speed networks. The necessary processes such as the plasma-activated deposition (PCVD) require state-of-the-art manufacturing techniques as well as a special know-how of our employees.

Sophisticated PCVD process

It is the highly accurate process of the so-called plasma-activated deposition (PCVD) that makes our fibre optic cable exceptionally proven for future requirements.
Transmission protocols like 10 Gigabit Ethernet require fibre qualities that also work under laser launch. For this purpose, the dispersion needs to be minimized over the whole diameter of the fibre. This is expressed by the term Differential Mode Delay (DMD) and is best achieved by the PCVD process which is, of course, applied to all fibres of series UC^FIBRE.

Primary coating

The fibre coating consists of a double layer of UV cured acrylate of type DLPC9.

Beside the perfect performance of fibres with this coating in unit cores, also an easy application in cable cores with central tubes has been considered. Thus the micro-bending properties have been improved in an elegant way.

This fibre coating can easily be removed over a wide range of ambient temperatures. No coating residues will be left on the fibre after removal.

All fibres coated with DLPC9 show extremely good parameters regarding mechanical strains. This allows the safe application of these optical fibres also in a rough environment.

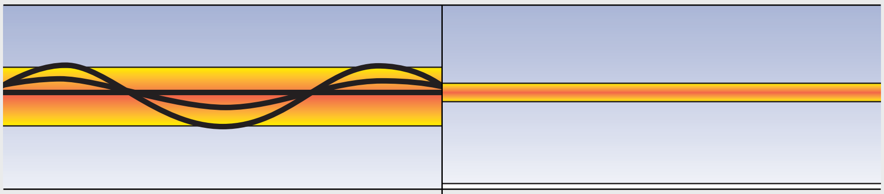
The PCVD process
requires clean-room conditions: Thousands of thin glass layers are applied to the inner surface of a silica glass tube. The individual layers slightly differ from each other due to the varying percentage of germanium dioxide in the surrounding silica glass, thus creating the desired refraction index.

Fibre designs

Users of fibre technology have the choice between multimode (MM) fibres with a big optical core and singlemode (SM) fibres with a very small core where only one single "light beam" can propagate.

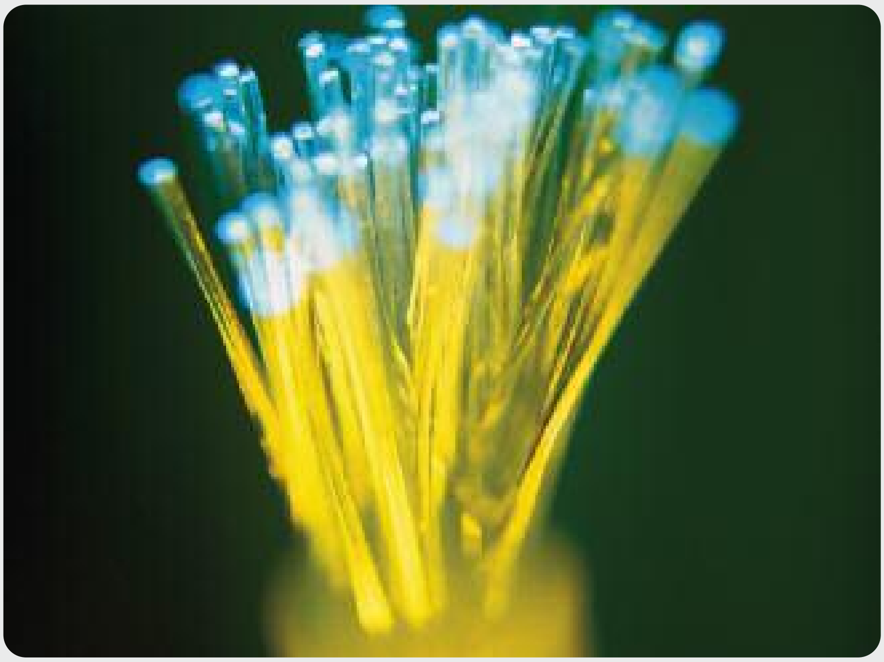
Application strengths

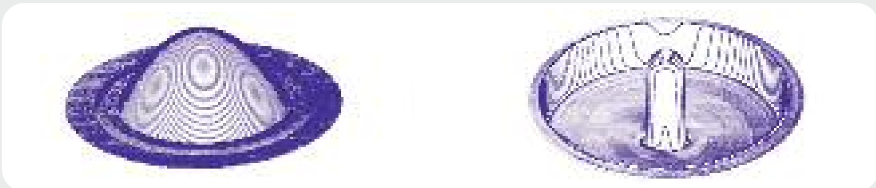
Compared to multimode fibres, single-mode fibres have excellent transmission properties. However, its use requires more demanding transmission elements as well as narrow tolerance connecting components. Due to their strengths, multimode fibres are therefore mainly applied in local networks where short lengths dominate. However, in broadband access networks, for long distances and especially in telecom transmission networks, only singlemode fibres are applied.



Graded index fibre(GI)

Single-mode fibre(E)





Grade-index profile

A multimode fibre must have a refraction index with a gradient profile. Only by this way the different light beams will arrive at the receiver in sequence. Otherwise, the modal dispersion would impede the safe separation of quickly succeeding pulses. The longer the fibre length, the stronger this effect is. Therefore, every fibre is characterized by a specific length limit. High-quality optical fibres have a high length limit.

Step-index profile

Compared to other light waves, there are no delay skews with singlemode fibres. Decisive for transmission bandwidth are rather material-related dispersion mechanisms. A typical value for the band width is 10GHz/km. Singlemode fibres enable wavelength ranges with the lowest attenuation at 1550 nm and beyond this up to 1625 nm.

HighCap Access – MAXCAP 550™

Even with long distances, UC^FIBRE cables have a low attenuation and a high bandwidth. They ensure an excellent transmission potential for dynamic data networks. Also the other advantages are convincing: maximum link distances for a cost-effective design of the central network management, no electromagnetic interference, no crosstalk, safe potential separation and increased tap proof.

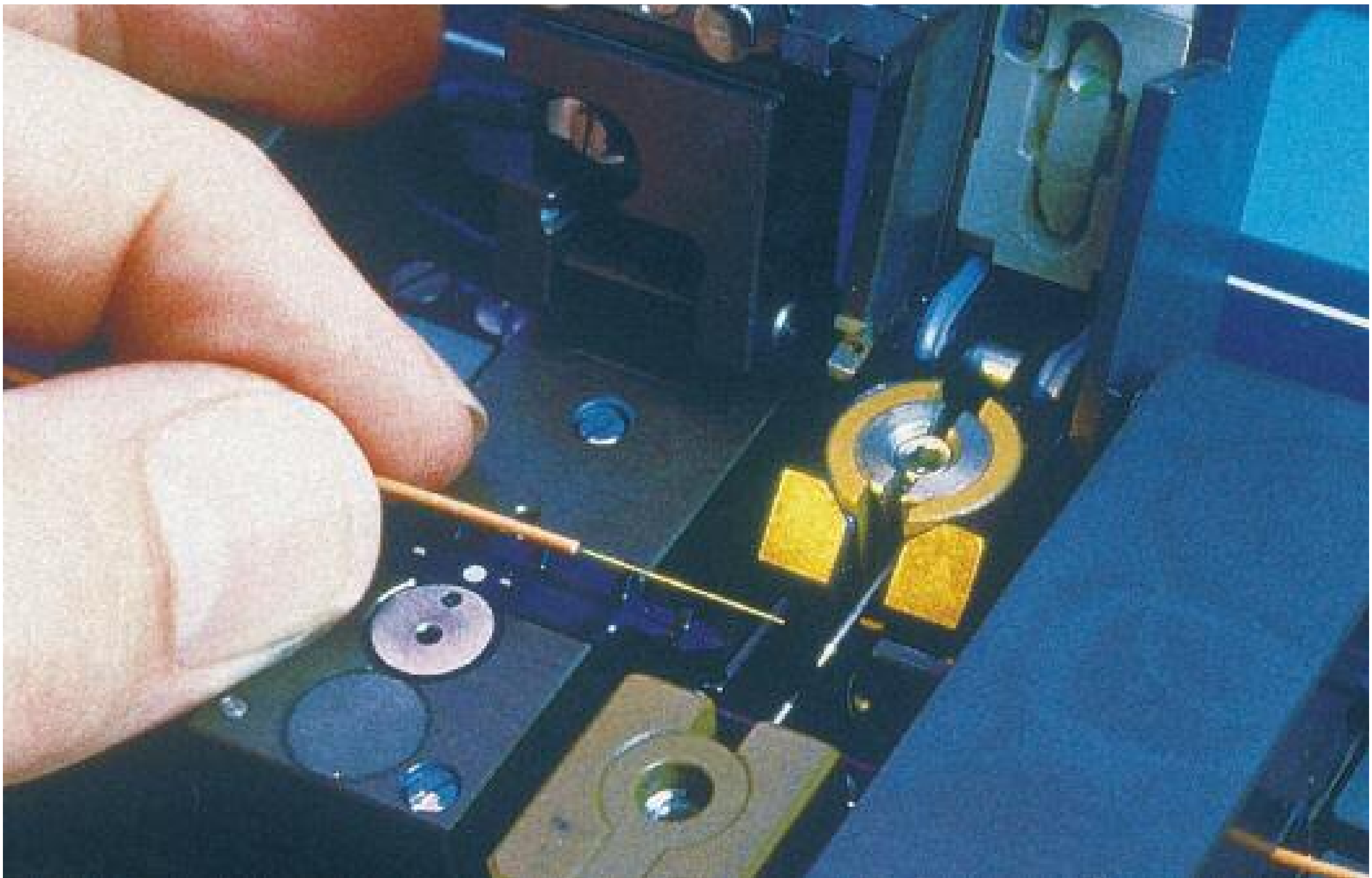
Fibre bandwidth
Fibre optic cables of Draka Comteq set standards with regard to bandwidth. The decisive performance criterion of a multimode fibre is the modal bandwidth. The more the bandwidth decreases the more the fibre length increases. This is mainly due to the different dispersion ways of the light which lead to mode dispersion. This mode dispersion again results in a pulse expansion and limits the pulse rate. If the pulses are no longer separable, no signal identification is possible. Therefore Draka only applies fibres characterized by a minimum pulse expansion.

Fibre attenuation
The lower the attenuation the more information arrives at the receiver. The attenuation curve of a fibre optic cable looks like a roller coaster. This strange curve is due to resonance, dispersion and absorption in the glass. Areas showing a particularly low attenuation are called „optical windows". Therefore, fibre optic data cables are optimized for these wavelength ranges.

Maximum link distances due to laser-optimized fibres
For the application in new high-speed network protocols with 1 Gbit Ethernet, our fibre optic cables have been laser-optimized – as documented by the HiCap™ certificate. At a wavelength of 1310 nm, they enable a distance of 2000 m which is twice as much as proposed by the IEEE.

The cost-effective 10 Gbit Ethernet at 850nm is ideally supported by MaxCap 300™, the high-quality OM3 multimode fibre of the well proven PCVD process.

The OM3+ Highend fibre MaxCap 550™ offers optimal prospects for the future. Without re-installations, idle times and additional investments, it makes distances possible which allow the change to the next faster transmission protocol by using the existing network structure on the same infrastructure. It does not matter whether it concerns the frequently used applications with light emitting diodes (LED) or new processes on the basis of VCSE lasers or the high-quality Fabry-Perot lasers for backbone applications with highest data rates of up to 10 Gigabits/s.



Draka's MaxCap 550™ blue print for new OM4 standard:

OM4 multimode fibre is ideal for 10G link applications requiring a higher power budget, for example when more connectors are required, which is the case in Data Centres. They are also perfect for 10G applications requiring a longer distance than 300 meters (up to 550 meters). Finally, OM4 fibres are future proof, especially for 40 Gb/s and 100 Gb/s Ethernet solutions.

These new system applications are currently under development by IEEE802.3ba, where an extended distance version is considered up to 250 meters using OM4 multimode fibre above the currently agreed 100 meters. In addition, Fibre Channel is considering using OM4 multimode fibre for its future high speed solutions.

The evolution of fibre optic technology through new manufacturing techniques and processes is revolutionizing data networks as they steadily progress towards 10Gb/s applications and upwards to 40Gb/s and 100Gb/s Ethernet solutions.

Draka is already able to conform to OM4 specifications with its MaxCap 550™ multimode fibre, putting it in the forefront in replying to industry requirements for cable that can extend link distances in next generation data communications networks.

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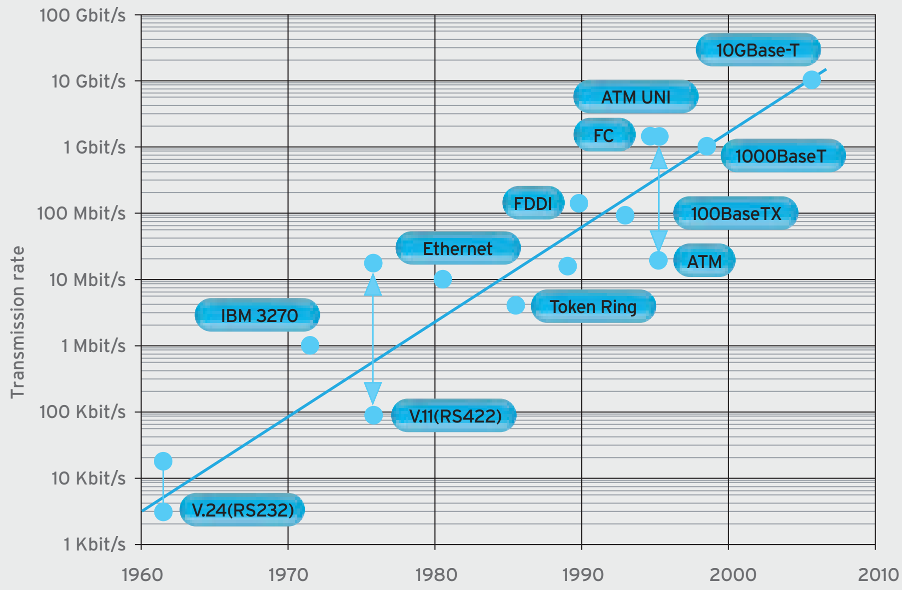
Still permanent growth



		Ethernet applications at 850 nm			Ethernet applications at 1300 nm		
Class	Type	100Base SX	1000Base SX	10GBase SR	100Base SX	1000Base LX	10GBase LX4
OM1	Standard 62,5 um 200/600 MHz.km	300 m	275 m	35 m	2000 m	550 m	300 m
OM2	Premium 50 um 600/1200 MHz.km	300 m	550 m	86 m	2000 m	550 m	300 m
OM1+	HiCap 62,5 um 1G/1000 m	300 m	500 m	65 m	2000 m	1000 m	450 m
OM2+	HiCap 50 um 1G/2000 m	300 m	750 m	110 m	2000 m	2000 m	900 m
OM3	MaxCap 300 50 um 10G/300 m	300 m	900 m	300 m	2000 m	550 m	300 m
OM3+	MaxCap 550 50 um 10G/550 m	300 m	1100 m	550 m	2000 m	550 m	300 m

Singlemode fibres

Today, the singlemode fibre according to the ITU-T G.652 standard is considered to be 'a classic'. It meets international standards and is to be found in countless communication networks. Its transmission performance is excellent. Singlemode fibres of series UC^{FIBRE} are based on the matched-cladding principle. Thus an optimum splicing performance is achieved that is compatible with all fibres known on the market.

Low Water Peak: Singlemode fibres according to ITU-T:G.652.D

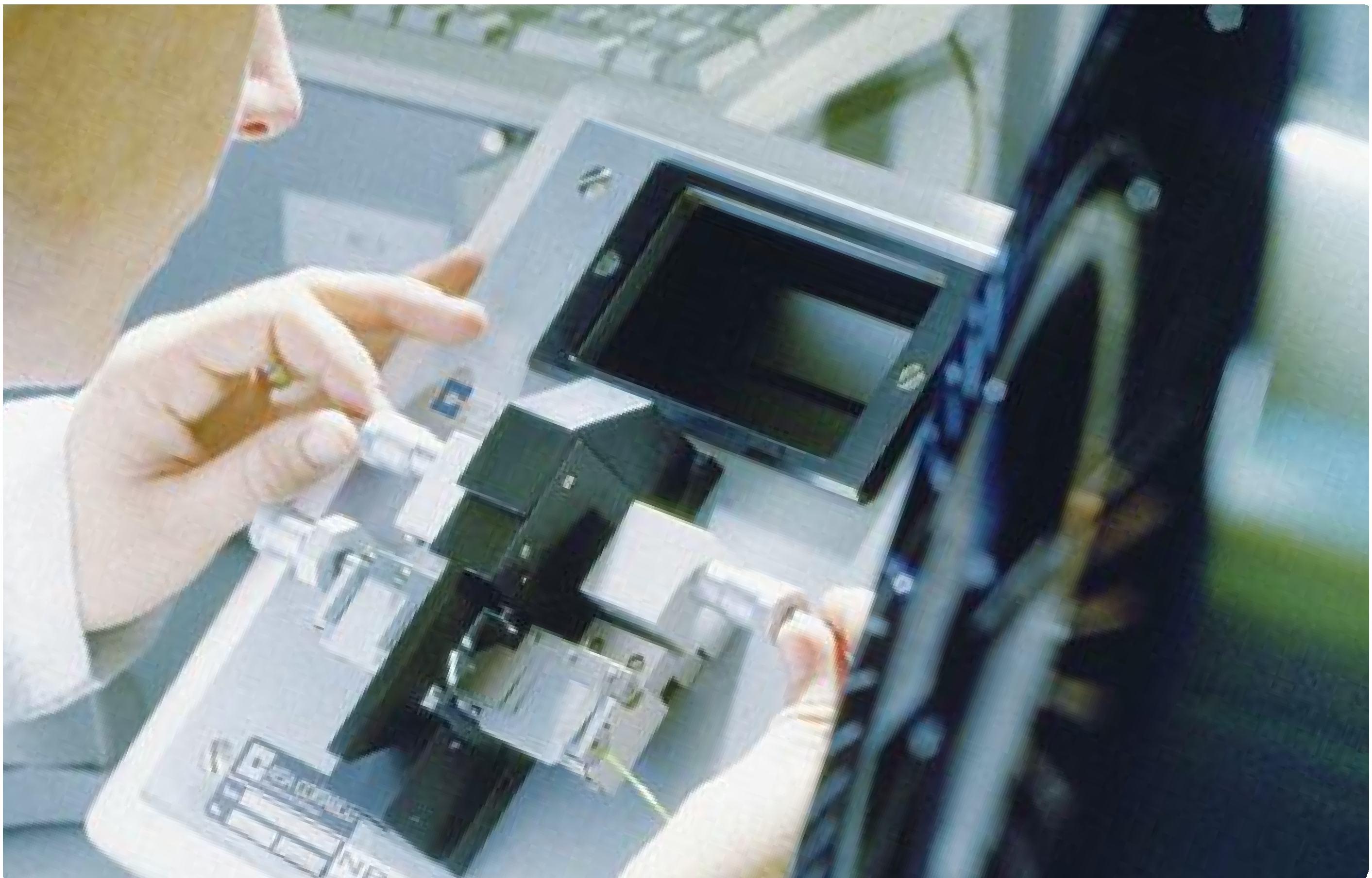
This singlemode fibre is attenuation-optimized over the whole range from 1260 nm to 1625 nm. Same as with fibre types according to ITU-T G.652 B, the attenuation values at 1310 nm and 1550 nm are kept at a very low level here. Also for the wavelength 1385, the classic water peak region, optimum attenuation values are achieved.

Thus, this new fibre type offers high flexibility for the application in modern optical transmission technologies (single channel, wide and Dense Wavelength Division Multiplex) as well as for combinations of new and traditional transmission systems. This optical fibre type complies with and even exceeds the IEC 60793-2-50 Type B 1.3 Optical Fibre.

Dispersion-optimized singlemode fibre according to ITU-T G.655.E/G.656

This NZD singlemode fibre has been specifically developed for the application of the Dense Wavelength Division Multiplex (DWDM) from 1530 nm to 1625 nm (C and L band). Hence, the ideal optical parameters – such as a defined dispersion optimum and low attenuation – are exactly adjusted to these wavelengths between 1530 nm and 1625 nm. Draka fibres of this type exceed the international standard IEC 60793-2-50 Type B.4/B.5.

With these fibre properties, costs for amplifiers and particularly for Dispersion Compensating Modules (DCM) can be saved especially in metro and city networks, but also in many trunk networks. High system reserves can be reached with these NZD fibres as to bit rates, e.g. 10 to 40 GBit/s per channel, and distances, e.g. 40 to 80 km.



BendBright^{xs}

The key feature in the fibre design that allows for such significant improvement in macro bending performance is the insertion of a field confining "trench" in the fibre cladding. This trench reduces the optical power in the region just outside the guiding core, which is very beneficial in keeping the signal inside the fibre when the fibre is bent. Using a trench to achieve this level of performance is only possible using Draka's versatile Plasma Chemical Vapor Deposition (PCVD) process.

As the figure below depicts, BendBright^{xs} exceeds the bend loss requirements of ITU-T G.657.B, the most stringent bending standard in the industry. This is an order of magnitude improvement over Draka's 1st generation bend-insensitive fiber, BendBright^{xs}, as well as conventional ESMF. BendBright^{xs} is fully compliant with both the A and B classes of the ITU-T G.657 bend insensitive fibre standard, established in 2006. The fibre is also fully compliant with ITU-T G.652.D low water peak singlemode fibre specification.

Why BendBright^{xs} ?

- 100x bending improvement over SMF
- Exceeds toughest bending standards; ITU-T G.657.B
- Fully backwards compatible with SMF; G.652.D compliant
- Over 250 million meters sold since 2006
- Deployed in over 30 countries worldwide
- Greater than 10 million splices and connectors
- Used everywhere in the network!

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