



The Fibreoptic Industry Association

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UNDERSTANDING OM1, OM2, OM3, OS1, OS2 and more!

by
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At their meeting in Los Cabos, Mexico of ISO/IEC JTC1 SC25 WG3 (23rd-27th March 2009) it was confirmed that the terms OM1, OM2 etc. applied to cabled optical fibre and also that they would be termed "Category". This latter aspect matches the terminology of EN 50173 standards since 2002. However, the application of the term Category to cabled optical fibres (rather than the optical fibres themselves - or to cables, which could contain optical fibres of different specifications) has led to amendments being required to all the generic cabling standards in the international and European areas. The change has even filtered down to current TIA activity in North America.

This White Paper is based on the information on the OM and OS designations in a White Paper produced in February 2008 but has been updated to take account of the above confirmation and associated changes.

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Currently we have five cabled all-silica optical fibre Categories specified in the published generic cabling standards. Internationally, ISO/IEC 11801 Ed 2.1:2009 specifies Categories OM1, OM2, OM3 and OS1. Another amendment of ISO/IEC 11801, to be published in early 2010, is also going to include Category OS2 (which already exists in ISO/IEC 24702; Generic cabling for industrial premises). In Europe and the UK, BS EN 50173-1:2007 contains all five specifications but the specifications for OS1 differ to that of the ISO/IEC standards. Category OM4 cabled optical fibre is to be specified in amendments of both ISO/IEC 11801 and BS EN 50173-1.

This White Paper explains the linkage between optical fibres specifications, cabled optical fibre Categories and optical fibre cable standards Table 1 and Table 2 shows the performance requirements for the cabled optical fibre Categories in the ISO/IEC and EN standards including the changes in the amendments listed above (more details about OM4 and its role are given in a separate White Paper)..

Table 1: Cabled multimode optical fibre Category specifications

Table with 7 columns: Cabled optical fibre Category, Optical fibre of BS EN/IEC 60793-2-10, Maximum attenuation (dB/km), and Minimum modal bandwidth MHzxkm (subdivided into Overfilled launch and Laser launch).

Table 2: Cabled singlemode optical fibre Category specifications

Table with 5 columns: Cabled optical fibre Category, Optical fibre of BS EN/IEC 60793-2-50, and Maximum attenuation (dB/km) at three wavelengths.

Tables 1 and 2 also shows the types of optical fibre that are used to create the cabled Categories.

BS EN 60793-2-10 (equivalent to IEC 60793-2-10) specifies types or categories (the two words are used interchangeably in the standard) of multimode optical fibres designated A1. A1a optical fibres are 50/125 µm and A1b optical fibres are 62,5/125 µm. A1a is subdivided into A1a.1 and A1a.2 and in future a A1a.3 will be included to support the production of OM4 cabled optical fibre. OM1 and OM2 can be produced from any A1a.* or A1b optical fibre. OM3 requires the use of A1a.2 (although in the future A1a.3 could also be used when finally specified).

BS EN 60793-2-50 (equivalent to IEC 60793-2-50) specifies classes of singlemode optical fibres. OS2 requires the use of B1.3 optical fibre only. The difference between the international and European standards is found in the optical fibres used to build OS1 cabled optical fibre. EN 50173-1 requires either optical fibre of class B1.3 or class B6_a and cabled performance is specified at 1310nm, 1383 nm and 1550 nm. The ISO/IEC standard specifies OS1 to be produce from B1.1, B1.3 or B6_a optical fibres. The addition of B1.1. prevent the specification of the whole set at 1383 nm (B1.1 is allowed to have a water peak and would not pass any requirement applied at that wavelength)

The IEC and EN committees have strengthened the relationship between optical fibre specifications of the BS/EN -IEC 60793 series, Categories of cabled optical fibre and the cables themselves in the production of their cable standards listed below which contain references to OM1, OM2, OM3 and OS1:

- Indoor cables (see Inset 1 below)
 - IEC 60794-2-11:2005 (and BS EN 60794-2-11:2005): Detailed specification for simplex and duplex cables for use in premises cabling
 - IEC 60794-2-21:2006 (and BS EN 60794-2-11:2006): Detailed specification for multi-fibre optical distribution cables for use in premises cabling
 - IEC 60794-2-31:2006 (and BS EN 60794-2-31:2006): Detailed specification for optical fibre ribbon cables for use in premises cabling
- Outdoor cables (see Inset 1 and Inset 2 overleaf)
 - IEC 60794-3-12:2006 (and BS EN 60794-3-12:2006): Detailed specification for duct and directly buried optical telecommunication cables for use in premises cabling
 - IEC 60794-3-21:2006 (and BS EN 60794-3-21:2006): Detailed specification for optical self-supporting aerial telecommunication cables for use in premises cabling

All of these published standards contain the text:

“Depending on the fibre type, the attenuation coefficient of the cabled *optical* fibre shall be less than the maximum values in Table 1 for the multimode fibres and less than the maximum values in Table 2 for single-mode fibres - for the wavelengths listed in the column headings.

Table 1 – Multimode maximum cable attenuation coefficient (dB/km)

Fibre type	Attenuation coefficient at 850 nm	Attenuation coefficient at 1 300 nm
IEC 60793-2-10, A1a.1 type	3,5	1,5
IEC 60793-2-10, A1a.2 type	3,5	1,5
IEC 60793-2-10, A1b type	3,5	1,5

Table 2 – Single-mode maximum cable attenuation coefficient (dB/km)

Fibre type	Attenuation coefficient at 1 310 nm	Attenuation coefficient at 1 550 nm
IEC 60793-2-50, B1.1 or B1.3 type	1,0	1,0

NOTE: It is true that the detailed specifications for MMF cables specify the bandwidth of the uncabled optical fibre but this is both because the test is applied to the optical fibre in production, and that bandwidth is not considered to be adversely affected during the cabling process.

Inset 1

Inset 2

The drafts of the outdoor standards contain the text:

“Depending on the fibre type, the attenuation coefficient of the cabled fibre shall be less than the maximum values in Table 1 for the multimode fibres and less than the maximum values in Table 2 for single-mode fibres - for the wavelengths listed in the column headings.

Table 1 – Multimode maximum cable attenuation coefficient (dB/km)

Fibre category	Attenuation coefficient at 850 nm	Attenuation coefficient at 1 300 nm	Performance codes
IEC 60793-2-10, A1a.1 type	3,5	1,5	OM1, OM2, OM3
IEC 60793-2-10, A1a.2 type	3,5	1,5	OM1, OM2, OM3
IEC 60793-2-10, A1b type	3,5	1,5	OM1, OM2, OM3

Table 2 – Single-mode maximum cable attenuation coefficient (dB/km)

Fibre category	Wavelengths (nm)	Maximum attenuation coefficient	Performance code
IEC 60793-2-50, B1.1 or B1.3	1310, 1550	1,0	OS1
IEC 60793-2-50, B1.3	1310, 1383, 1550	0,4	OS2

NOTE: It is true that the detailed specifications for MMF cables specify the bandwidth of the uncabled optical fibre but this is both because the test is applied to the optical fibre in production, and that bandwidth is not considered to be adversely affected during the cabling process.

OS2 is included in new IEC and EN cable standards (still in development and as shown in Inset 2) but only as a outdoor cable specification in the new 60794-3-12 and 60794-3-21 standards. This is because OS2 was born in the industrial premises standard ISO/IEC 24702 to support 5 km and 10 km channels - which are by definition “outdoor”. More importantly, the low attenuation values of OS2 are only realistic in loose-tube cables in which the original optical fibre performance is almost unaltered by the cabling process (the same could be said of “blown fibre”).

Produced 28th February 2008
Updated 1st October 2009