



The Fibreoptic Industry Association

www.fia-online.co.uk

Secretary: Jane Morrison

The Manor House
BUNTINGFORD
Hertfordshire SG9 9AB
United Kingdom

Tel: +44 (0) 1763 273039 Fax: +44 (0) 1763 273255

e-mail: jane@fiasec.demon.co.uk

OPTICAL FIBRE CABLING AND DATA NETWORKS

SUMMARY APPLICATION NOTE: DAN002

(Issue 002: 7th December 2015)

The following information is taken from EN 50173-1:2011 but has been updated by removing the OF Class information (expected to be removed in the next edition of that standard).

As such the information represents the single most comprehensive summary of the demands placed by data (local area networks) on installed optical fibre cabling infrastructure. It is not intended to be used in place of the standards or without an understanding of the terms used in the tables (as is provided in the FIA Technical Support document TSD-2000-1-1: LAN Application Support Guide).

Table 1 and Table 2 below contain the maximum channel insertion losses (CIL) and lengths specified in their respective application standards for most of the commonly used applications.

For singlemode, Table 1 shows the designation OS1. This is expected to be amended to become OS1a during the revision of the EN 50173-1 standard but is retained here (and makes no difference to the information presented).

For multimode, Table 2 details the application support over Category OM1 and OM2 cabled optical fibre - despite support for those Categories also expected to be removed from the normative sections during the revision of the EN 50173-1 standard.

Table 1 - Specifications of SMF applications

Network Application	λ nm	OS1		OS2	
		CIL ^a dB	L ^b m	CIL ^a dB	L ^b m
ATM at 51,84 Mbit/s	1 310	10,0	2 000	10,0	20 000
ATM at 155,52 Mbit/s	1 310	7,0	2 000	7,0	12 500
ATM at 622,08 Mbit/s	1 310	7,0	2 000	7,0	12 500
DIS 14165-111: Fibre Channel (FC-PH) at 266 Mbit/s	1 310	6,0	2 000	6,0	10 000
DIS 14165-111: Fibre Channel (FC-PH) at 531 Mbit/s	1 310	14,0	2 000	14,0	30 000
DIS 14165-111: Fibre Channel (FC-PH) at 1062 Mbit/s	1 310	6,0	2 000	6,0	10 000
1 Gbps FC (1,0625 GBd) ^c	1 310	7,8	5 800	7,8	10 000
2 Gbps FC (2,125 GBd) ^c	1 310	7,8	5 800	7,8	10 000
4 Gbps FC (4,25 GBd) ^c	1 310	7,8	2 800	7,8	10 000
8 Gbps FC (8,5 GBd) ^c	1 310	6,4	4 400	7,8	10 000
16 Gbps FC (14,025 GBd)	1 310	6,4	4 400	7,8	10 000
IEEE 802-3ae: 1000BASE-LX ^c	1 310	4,56	2 560	4,56	5 000
ISO/IEC 9314-4: FDDI SMF-PMD ^c	1 310	10,0	2 000	10,0	20 000
IEEE 802.3: 10GBASE-LX4 ^c	1 310	6,2	4 200	6,2	10 000
IEEE 802.3: 10GBASE-LR/LW ^c	1 310	6,2	4 200	6,2	10 000
IEEE 802.3: 10GBASE-ER/EW ^c	1 550	10,9	8 900	10,9	22 250
IEEE 802.3: 40GBASE-LR4 ^c	1 310	6,7	4 700	6,7	10 000
IEEE 802.3: 100GBASE-LR4 ^c	1 310	8,3	8 300	8,3	10 000
IEEE 802.3: 100GBASE-ER4 ^c	1 550	18,0	16 000	18,0	40 000
^a	CIL is the maximum channel insertion loss (or optical power budget, as applicable) as defined in the application standard.				
^b	L is the lower of: the maximum channel length specified in the application standard; a calculated length from the CIL with 2,0 dB allocated to connecting hardware.				
^c	A bandwidth limited application at the channel length shown. The use of lower attenuation components to produce channels exceeding the length shown cannot be recommended.				

Table 2 - Specifications of MMF applications

Network Application	λ nm	Core dia μm	OM1		OM2		OM3		OM4	
			CIL ^a dB	L ^b m	CIL ^a dB	CIL ^a dB	L ^b m	L ^b m	CIL ^a dB	L ^b m
IEEE 802-3: FOIRL	850	50	3,3	514	3,3	514	3,3	514	3,3	514
		62,5	9,0	1 000	9,0	1 000	-	-	-	-
IEEE 802-3: 10BASE-FL, FP & FB	850	50	6,8	1 514	6,8	1 514	6,8	1 514	6,8	1 514
		62,5	12,5	2 000	12,5	2 000	-	-	-	-
ISO/IEC TR 11802-4: Token Ring (4 and 16 Mbit/s)	850	50	8,0	1 857	8,0	1 857	8,0	1 857	8,0	1 857
		62,5	13,0	2 000	13,0	2 000	-	-	-	-
ATM at 51,84 Mbit/s	1 300	50	5,3	2 000	5,3	2 000	5,3	2 000	5,3	2 000
		62,5	10,0	2 000	10,0	2 000	-	-	-	-
ATM at 155,52 Mbit/s	850	50	7,2	1 000	7,2	1 000	7,2	1 000	7,2	1 000
		62,5	7,2	1 000	7,2	1 000	-	-	-	-
	1 300	50	5,3	2 000	5,3	2 000	5,3	2 000	5,3	2 000
		62,5	10,0	2 000	10,0	2 000	-	-	-	-
ATM at 622,08 Mbit/s ^c	850	50	4,0	300	4,0	300	4,0	300	4,0	300
		62,5	4,0	300	4,0	300	-	-	-	-
	1 300	50	2,0	330	2,0	330	2,0	330	2,0	330
		62,5	6,0	500	6,0	500	-	-	-	-
DIS 14165-111: Fibre Channel (FC-PH) at 133 Mbit/s	1 300	50	-	-	-	-	-	-	-	-
		62,5	6,0	1 500	6,0	1 500	6,0	1 500	6,0	1 500
DIS 14165-111: Fibre Channel (FC-PH) at 266 Mbit/s	850	50	12,0	2 000	12,0	2 000	12,0	2 000	12,0	2 000
		62,5	12,0	700	12,0	700	-	-	-	-
	1 300	50	5,5	2 000	5,5	2 000	5,5	2 000	5,5	2 000
		62,5	6,0	1 500	6,0	1 500	-	-	-	-
DIS 14165-111: Fibre Channel (FC-PH) at 531 Mbit/s	850	50	8,0	1 000	8,0	1 000	8,0	1 000	8,0	1 000
		62,5	8,0	350	8,0	350	-	-	-	-
DIS 14165-111: Fibre Channel (FC-PH) at 1062 Mbit/s ^c	850	50	4,0	500	4,0	500	4,0	500	4,0	500
		62,5	4,0	300	4,0	300	-	-	-	-
1 Gbps FC (1,0625 GBd) ^c	850	50	-	-	3,85	500	2,62	500	2,62	500
		62,5	3,0	300	-	-	-	-	-	-
2 Gbps FC (2,125 GBd) ^c	850	50	2,10	150	2,62	300	3,31	300	3,31	300
4 Gbps FC (4,25 GBd) ^c	850	50	-	-	2,06	150	2,88	380	3,02	420
8 Gbps FC (8,5 GBd) ^c	850	50	-	-	1,68	50	2,19	150	2,22	190
16 Gbps FC (14,025 GBd) ^c	850	50	-	-	1,63	35	1,95	100	1,97	125
IEEE 802-3: 1000BASE-SX ^c	850	50	-	-	3,56	550	3,56	550	3,56	550
		62,5	2,6	275	-	-	-	-	-	-
IEEE 802-3: 1000BASE-LX ^c	1 300	50	2,35	550	2,35	550	2,35	550	2,35	550
		62,5	2,35	550	2,35	550	-	-	-	-
EN ISO/IEC 9314-3: FDDI PMD	1 300	50	6,3	2 000	6,3	2 000	6,3	2 000	6,3	2 000
		62,5	11,0	2 000	11,0	2 000	-	-	-	-
ISO/IEC 8802-3: 100BASE-FX	1 300	50	6,3	2 000	6,3	2 000	6,3	2 000	6,3	2 000
		62,5	11,0	2 000	11,0	2 000	-	-	-	-
IEEE 802.3: 10GBASE-SR/SW	850	50	-	-	1,80	82	2,60	300	2,60	300
		62,5	1,60	32	-	-	-	-	-	-
IEEE 802.3: 10GBASE-LX4 ^c	1 300	50	2,0	300	2,0	300	2,0	300	2,0	300
		62,5	2,0	300	2,0	300	-	-	-	-
IEEE 802.3: 40GBASE-SR4 ^c	850	50	-	-	-	-	1,90	100	1,50 ^d	150 ^d
		50	-	-	-	-	1,90	100	1,50 ^d	150 ^d
IEEE 802.3: 100GBASE-SR10 ^c	850	50	-	-	-	-	1,90	100	1,50 ^d	150 ^d
		50	-	-	-	-	1,90	100	1,50 ^d	150 ^d

^a CIL is the maximum channel insertion loss (or optical power budget, as applicable) as defined in the application standard.

^b L is the lower of:
the maximum channel length specified in the application standard;
a calculated length from the CIL with 1,5 dB allocated to connecting hardware.

^c A bandwidth limited application at the channel length shown. The use of lower attenuation components to produce channels exceeding the length shown cannot be recommended.

^d Subject to a maximum total connecting hardware loss of 1,0dB.