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General rules of optical fibers

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee as the result of proposal of revision of Japanese Industrial Standard submitted by Optoelectronic Industry and Technology Development Association (OITDA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS C 6820:2005** is replaced with this Standard.

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General rules of optical fibers

Introduction

This Japanese Industrial Standard has been prepared based on the third edition of **IEC 60793-1-1** published in 2008 and the sixth edition of **IEC 60793-2** published in 2007, by incorporating them without any modification of the technical contents for the corresponding parts, but adding some **JIS**-original specifications that are not given in the said corresponding International Standards.

Classification of optical fibers according to the material of multimode optical fibers and designation of optical fibers given in this Standard are not the same as those of the corresponding International Standards.

The portions with continuous sidelines or dotted underlines are the matters in which the contents of the corresponding International Standards have been modified. A list of modifications with the explanations is given in Annex JA.

1 Scope

This Standard specifies the general matters of optical fibers, jacketed optical fibers and optical fiber codes.

NOTE : The International Standards corresponding to this Standard and the symbol of degree of correspondence are as follows:

IEC 60793-1-1:2008 *Optical fibres—Part 1-1: Measurement methods and test procedures—General and guidance*

IEC 60793-2:2007 *Optical fibres—Part 2: Product specifications—General* (Overall evaluation: MOD)

The symbols which denote the degree of correspondence in the contents in the corresponding International Standards and **JIS** are IDT (identical), MOD (modified) and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Terms and definitions

For the purpose of this Standard, the following terms and definitions apply.

Terms and definitions related to construction, transmission properties and measurement of optical fibers are given in Annex A.

2.1 optical fibers

fibers made of derivatives, which transmit light

It is a generic name for bare optical fibers, optical fibers, jacketed optical fibers and optical fiber cords.

2.2 bare optical fibers

optical fibers composed only of glass core and glass cladding

2.3 optical fibers

optical fibers with plastic primary coating, optical fibers with glass cores and plastic cladding, or optical fibers with plastic cores and plastic cladding

2.4 jacketed optical fibers

optical fibers, with glass core(s), whose single core or multiple cores are coated with a suitable secondary layer

2.5 optical fiber cords

optical fibers with tensile strength, which are made by coating jacketed optical fibers or all plastic multimode optical fibers with plastic sheath

3 Category

The optical fibers are roughly divided by the number of propagation modes, and subdivided as follows:

3.1 Multimode optical fibers

Multimode optical fibers are categorized based on the material and the refractive index profile parameter. Table 1.1 shows the categories based on material, table 1.2 shows the categories based on refractive index, and table 1.3 shows symbols and types of multimode optical fibers.

Table 1.1 Categories of multimode optical fibers based on material

Category based on material	Material (core/cladding)
Silica-based	Silica-based glass/silica-based glass
Multi-component	Multi-component glass/multi-component glass
Plastic cladding	Silica-based glass/plastic
All plastic	Plastic/plastic

Table 1.2 Categories of multimode optical fibers based on refractive index profile

Category based on refractive index profile	Refractive index profile parameter $g^{a)}$
Graded index	$1 \leq g < 3$
Quasi step index	$3 \leq g < 10$
Step index	$10 \leq g < \infty$
Note ^{a)} See Annex A.	

Table 1.3 Category symbols and types of multimode optical fibers

Category symbol	IEC category symbol (informative)	Abbreviation based on material	Type of optical fibers based on refractive index profile
<u>SGI</u>	A1	Silica-based	Graded index
<u>SQI</u>	A2	Silica-based	Step index
<u>SSI</u>	A2	Silica-based	Quasi step index
<u>CSI</u>	None	Multi-component	<u>Step index</u>
<u>RSI</u>	A3	Plastic cladding	Step index
<u>PGI</u>	A4	All plastic	Graded index
<u>PQI</u>	A4	All plastic	Quasi step index
<u>PSI</u>	A4	All plastic	Step index

3.2 Single-mode optical fiber

Single-mode optical fibers are only made of silica-based materials. Category symbols and types of silica-based single-mode optical fibers are shown in table 2.

Table 2 Category symbols and types of silica-based single-mode optical fibers

Category symbol	IEC category symbol (informative)	Type of optical fiber	Description
SMA	B1.1	1 310 nm dispersion-unshifted	This dispersion-unshifted single-mode fiber is optimized for use in the 1 310 nm region but can be used in the 1 550 nm region.
SMA • T	B1.2	1 550 nm cut-off shifted	This category of dispersion-unshifted single-mode fiber is optimized for low loss in the 1 550 nm region.
SMA • U	B1.3	1 310 nm dispersion-unshifted, low OH	This category of dispersion-unshifted single-mode fiber is to extend the range of possible transmission signals, using 1 310 nm band power budgets.
SMB	B2	1 550 nm dispersion-shifted	This category of dispersion-shifted single-mode fiber is optimized for single-channel transmission in the 1 550 nm region.
<u>SMC</u>	<u>None</u>	<u>Dispersion-flattened</u>	This dispersion-flattened fiber is optimized for low dispersion over a wide range of wavelengths.
SMD	B4	Non-zero dispersion-shifted	This dispersion-shifted single-mode fiber is optimized for multiple channel transmission in the 1 550 nm region. The dispersion coefficient is required to be non-zero throughout the band from 1 530 nm to 1 565 nm.

Table 2 (concluded)

Category symbol	IEC category symbol (informative)	Type of optical fiber	Description
SME	B5	Wideband non-zero dispersion-shifted	This wideband non-zero dispersion-shifted single-mode fiber is optimized for multiple channel transmission in the wavelength range of 1 460 nm to 1 625 nm. This fiber can be used for both CWDM and DWDM systems.
SMF • A	B6_a	Low OH/bending loss insensitive	This category of single-mode fiber is optimized for improved bending loss, and for transmission in the wavelength range of 1 260 nm to 1 625 nm. It has the same transmission and connection properties as SMA • U fibers.
SMF • B	B6_b	Bending loss insensitive	This single-mode fiber is optimized for improved bending loss, and for transmission in the wavelengths of 1 310 nm, 1 550 nm and 1 625 nm. It has different connection properties than SMA • U, and is capable at lower values of bend radius than SMF • A.

3.3 Intraconnection optical fibers

Category symbols and types of intraconnection optical fibers are shown in table 3.

Table 3 Category symbols and types of intraconnection optical fibers

Category symbol	IEC category symbol (informative)	Type of optical fiber	Description
ICA	C1	Single-mode intraconnection fiber suitable for use with SMA fiber at wavelengths from 1 260 nm to 1 625 nm	This intraconnection fiber is optimized for precision glass geometry and improved macrobending, and generally having lower fiber cut-off wavelength compared to SMA fibers.
ICB	C2	Single-mode intraconnection fiber suitable for use from 1 260 nm to 1 360 nm	This intraconnection fiber with reduced mode field diameter is optimized for loss performance in the 1 310 nm region.
ICC	C3	Single-mode intraconnection fiber suitable for use from 1 530 nm to 1 625 nm	This intraconnection fiber with reduced mode field is optimized for loss performance in the 1 550 nm region.
ICD	C4	Single-mode intraconnection fiber suitable for use at 980 nm	This intraconnection fiber is intended to support 980 nm transmissions.

3.4 Polarization-maintaining optical fibers

The polarization-maintaining optical fibers are categorized by the following parameters.

The category symbols and types of polarization-maintaining optical fibers are shown in table 4.

Table 4 Category symbols and types of polarization-maintaining optical fibers

Category symbol	Type of optical fiber	Description
PMA	980 nm single-mode fiber	Polarization-maintaining fibers optimized for transmission in a wavelength of 980 nm
PMB	1 310 nm single-mode fiber	Polarization-maintaining fibers optimized for transmission in a wavelength of 1310 nm
PMC	1 550 nm single-mode fiber	Polarization-maintaining fibers optimized for transmission in a wavelength of 1550 nm

4 Type name**4.1 Composition of type name**

The composition of a type name shall be as given in the following arrangement. If any item(s) in the given arrangement is/are irrelevant to the fiber under question, or if the number of optical fibers or jacketed fibers is 1, the type name shall be arranged by excluding these items.

a) Optical fibers

	Symbol indicating the material of optical fiber 4.2.1	Symbol indicating the refractive index profile or the type of optical fiber 4.2.2	Symbol indicating the size of optical fiber 4.2.3	Symbol indicating other necessary matter 4.2.8
Example:	S	GI	— 50/125	— A1

b) Jacketed optical fibers

	Symbol indicating the material of secondary coating 4.2.4	Symbol indicating the number of optical fibers 4.2.5	Symbol indicating the material of optical fiber 4.2.1	Symbol indicating the refractive index profile or the type of optical fiber 4.2.2	Symbol indicating the size of optical fiber 4.2.3	Symbol indicating other necessary matter 4.2.8
Example 1	Y	—	S	GI	— 50/125	— J1
Example 2	Y	—	S	GI	— 50/125	— A1
Example 3	U	4	—	SMA	— 9.3/125	— J1
Example 4	U	4	—	SMB	— 9.3/125	— A1
Example 5	U	—	S	PMA	— 9.4/125	— J1