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SPECIFICATION
FOR
SINGLE-MODE OPTICAL FIBER NATURAL
(FutureGuide®-LWP)

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FUJIKURA'S SPECIFICATION FOR SINGLE-MODE OPTICAL FIBER (Fujikura Designation: FutureGuide®-LWP)

1. General

This specification covers a single-mode optical fiber optimized at a wavelength of 1310nm and 1550nm region, but also can be used in the wavelength of 1380nm region, complying with the subcategory G.652.D in the ITU-T recommendation G.652 June 2005.

Unless otherwise stated, the following characteristics are measured at ambient temperature (25 ± 5°C).

2. Structural specifications

Typical fiber structure is shown in Fig. 1.

No.	Item	Specified value	Reference standard
2.1	Fiber Materials		
2.1.1	Core material	Silica (SiO_2) doped with germanium dioxide (GeO_2)	
2.1.2	Cladding material	Pure silica (SiO_2)	
~~2.1.3~~	Coating material	Dual layers of UV-cured acrylate (Non-colored)	
2.2	Dimensions		
2.2.1	Mode dield diameter at 1310nm at 1550nm	 9.2 ± 0.4 μm 10.4 ± 0.8 μm	IEC60793-1-45, First edition 2001-07
~~2.2.2~~	Cladding diameter	125.0 ± 1.0 μm	IEC60793-1-20, First edition 2001-09
~~2.2.3~~	Coating diameter (Non-colored)	245 ± 5 μm	IEC60793-1-21, First edition 2001-08
2.3	Core concentricity error	≤ 0.5 μm	IEC60793-1-20, First edition 2001-09
2.4	Cladding non-circularity	≤ 1.0 %	IEC60793-1-20, First edition 2001-09
2.5	Coating-Cladding concentricity error	≤ 12 μm	IEC60793-1-21, First edition 2001-08
2.6	Coloring	Not applicable	

3. Optical specifications

No.	Item	Specified value	Reference standard
3.1	Attenuation		
3.1.1	Attenuation coefficient at 1310nm at 1383nm at 1550nm	 ≤ 0.35 dB/km ≤ 0.31 dB/km*1 ≤ 0.20 dB/km	IEC60793-1-40, First edition 2001-07
3.1.2	Attenuation vs. wavelength *2 1285 – 1330nm, ref. λ of 1310nm 1525 – 1575nm, ref. λ of 1550nm	 $\alpha \leq 0.05$ dB/km $\alpha \leq 0.05$ dB/km	IEC60793-1-40, First edition 2001-07
3.1.3	Macrobending *3 ϕ=32mm, 1 turn at 1550nm ϕ=50mm, 100 turns at 1310nm ϕ=50mm, 100 turns at 1550nm ϕ=60mm, 100 turns at 1625nm	 ≤ 0.50 dB ≤ 0.05 dB ≤ 0.1 dB ≤ 0.05 dB	IEC60793-1-47, First edition 2001-07
3.1.4	Attenuation uniformity	No point discontinuity greater than 0.1 dB at either 1310nm or 1550nm in the OTDR trace.	IEC60793-1-40, First edition 2001-07
3.2	Cut off wavelength		
3.2.1	Cable cut-off wavelength λ_{cc}	$\lambda_{cc} \leq 1260$ nm	IEC60793-1-44, First edition 2001-07
3.3	Chromatic dispersion		
3.3.1	Chromatic dispersion coefficient at 1285-1330nm at 1550nm	 ≤ 3.5 ps/(nm·km) ≤ 18 ps/(nm·km)	IEC60793-1-42, First edition 2001-07
3.3.2	Zero-dispersion wavelength λ_0	1302nm ≤ λ_0 ≤ 1322nm	
3.3.3	Zero-dispersion slope S_0	$S_0 \leq 0.092$ ps/(nm^2·km)	
3.4	Polarization mode dispersion (PMD)		
3.4.1	Link design value PMD_Q	≤ 0.08 ps/√km	IEC60793-1-48, First edition 2003-05

Notes:

*1. The attenuation at 1383nm after hydrogen aging in accordance with IEC60793-2-50, Jan 2002.

*2. The attenuation in a given wavelength range does not exceed the attenuation of the reference wavelength (λ) by more than the value α.

*3. The induced attenuation due to fiber wrapped around a mandrel of a specified diameter (ϕ).

*4. This characteristic is guaranteed under the free tension condition only.

4. Mechanical specifications

No.	Item	Specified Value	Reference Standard
4.1	Proof test*	≥ 1% (100kpsi or 0.7GPa)	IEC60793-1-30, First edition 2001-07
4.2	Fiber curl radius	≥ 4.0 m	IEC60793-1-34, First edition 2001-07

Note:

* The entire optical fiber length shall be tested with regard to the tensile strength.

5. Environmental specifications

No.	Item	Specified value	Reference standard
5.1	Environmental specifications	Induced attenuation at both 1310nm, 1550nm and 1625nm	
5.1.1	Temperature dependence * -60 to 85°C	≤ 0.05 dB/km	IEC60793-1-52, First edition 2001-07
5.1.2	Temperature-humidity cycling * -10 to 85°C and 4 to 98%R.H.	≤ 0.05 dB/km	IEC60793-1-52, First edition 2001-07
5.1.3	Water immersion at 23 ± 2°C	≤ 0.05 dB/km	IEC60793-1-53, First edition 2001-07
5.1.4	Dry heat * at 85 ± 2°C	≤ 0.05 dB/km	IEC60793-1-51, First edition 2001-07
5.1.5	Damp Heat 85°C at 85%R.H.	≤ 0.05 dB/km	IEC60793-1-50, First edition 2001-07

Note:
* Reference temperature = 23°C.

6. Performance characteristics

No.	Item	Typical value	Remark
6.1	Refractive index profile	Matched clad, step index profile	Shown in Fig.3
6.2	Refractive index difference Δ	Δ=0.36%	
6.3	Effective group index of refraction N_{eff} at 1310nm at 1550nm	 1.4675 1.4681	
6.4	Dynamic stress corrosion susceptibility parameter (n_d)	≥ 20	IEC60793-1-33, First edition 2001-08
6.5	Coating strippability F	1.3N ≤ F ≤ 8.9N	IEC60793-1-32, First edition 2001-07

Note:
These characteristics are typical values, therefore Fujikura do not guarantee.

7. Packing

The available reel lengths are as follows.

Length(km)	4.4	6.4	8.8	10.5	12.6	16.0
	19.0	21.0	23.0	24.0	25.2	50.4

The reel size shall be standardized by Fujikura Ltd. as shown in Fig. 4 and Fig. 5.
A Fujikura label(s) with the manufacture's name, the production No., the type of fiber and the fiber length shall be shown on each reel.
Other lengths are also available upon request.

8. Measurement data

If so requested by the customer, fiber data shall be transmitted electrically and precede each shipment.

1	Fiber length
2	Attenuation at 1310 nm
3	Attenuation at 1550 nm
4	Attenuation at 1383 nm
5	Cable cut-off wavelength
6	MFD at 1310 nm
7	Cladding diameter
8	Core concentricity error
9	Cladding non-circularity
10	Coating diameter
11	Zero-dispersion wavelength
12	Zero-dispersion slope
13	Dispersion at 1285 nm
14	Dispersion at 1330 nm
15	Dispersion at 1550 nm
16	The result of proof test

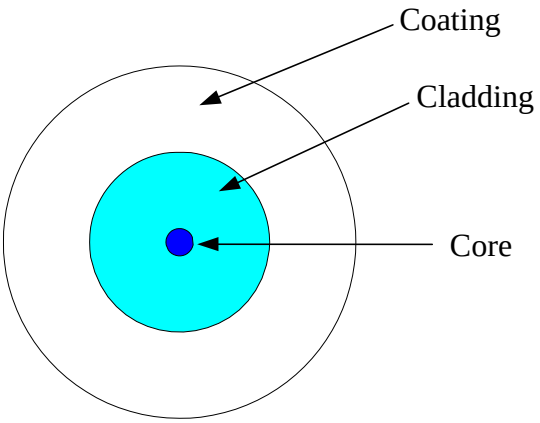

Fig.1 Structure of UV-cured acrylate fiber

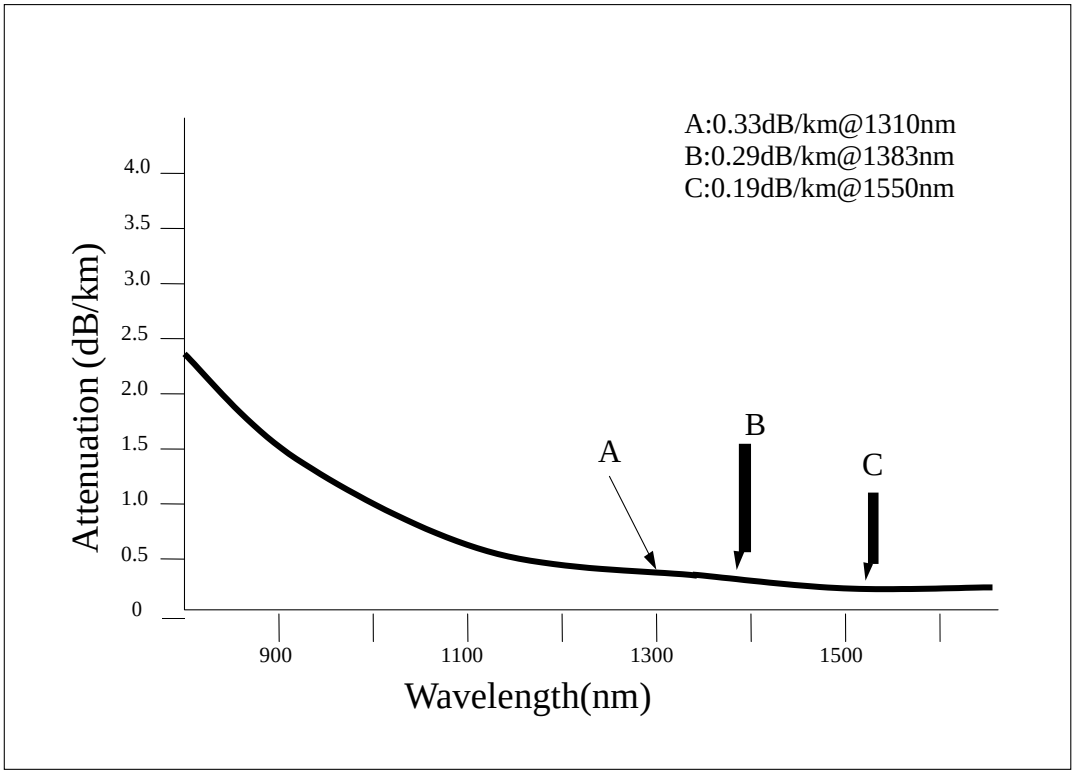

Fig.2 Spectral attenuation (Typical fiber)

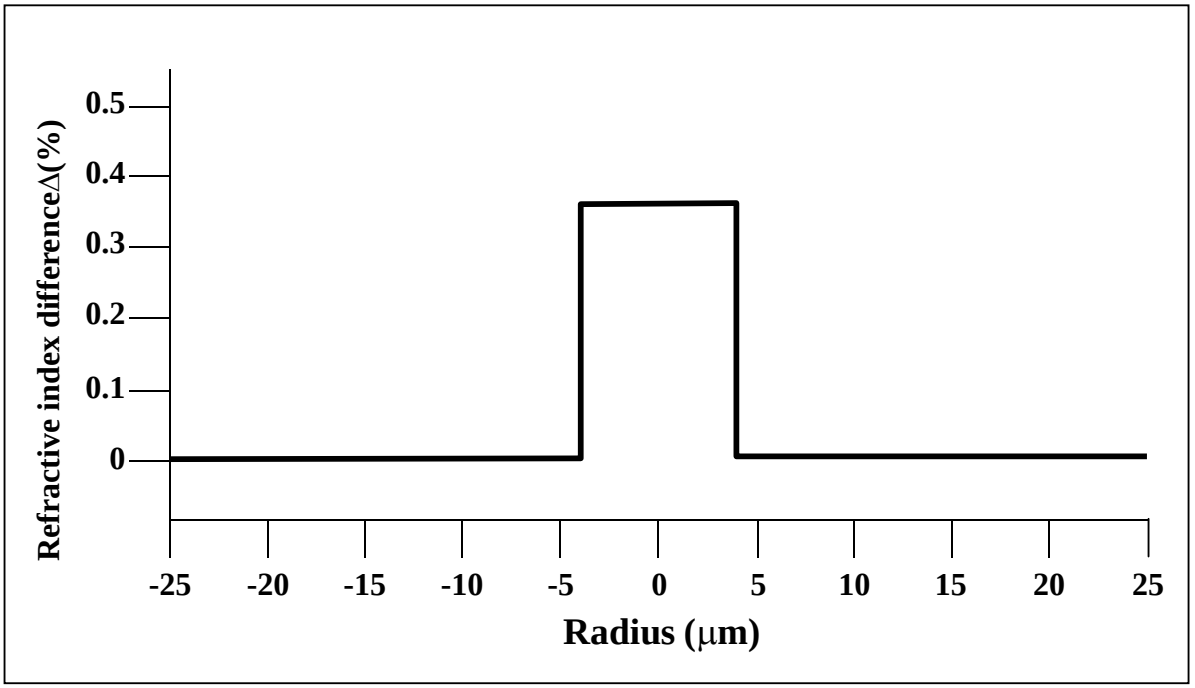

Fig.3 Refractive index profile (Typical fiber)

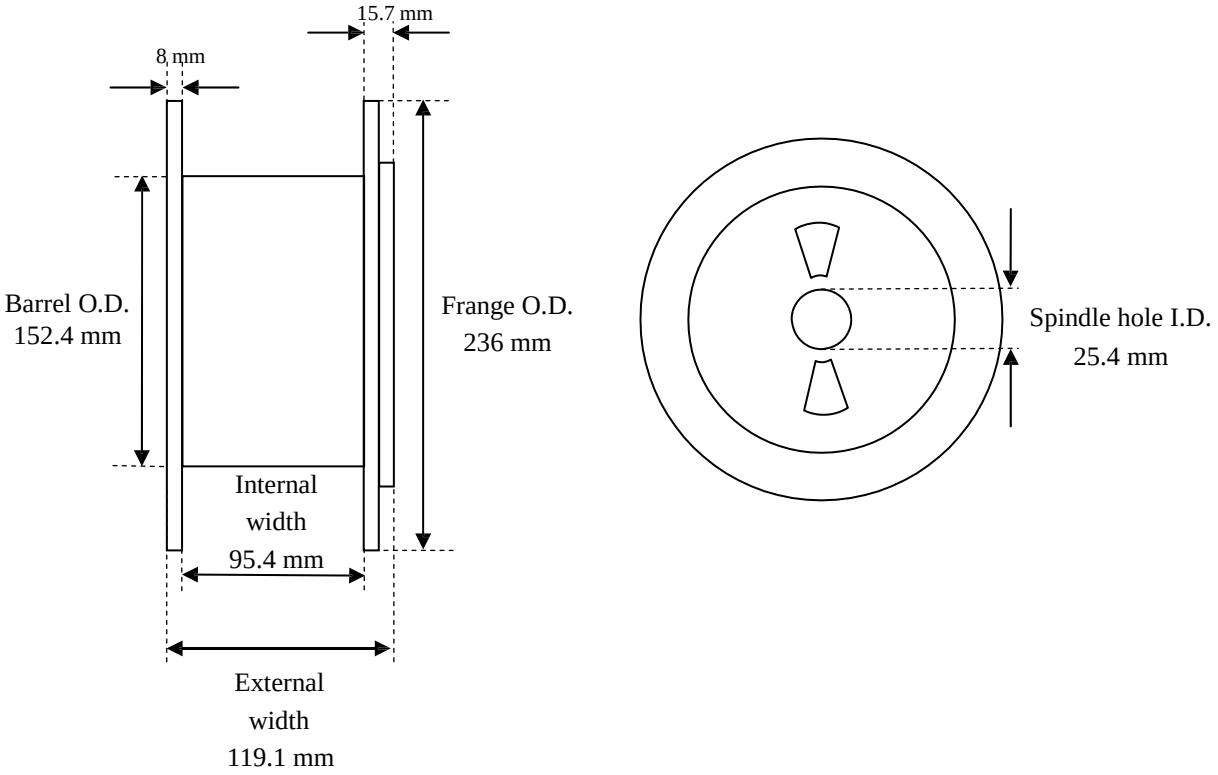

Fig. 4. Fiber Reel (for 25.2 km)

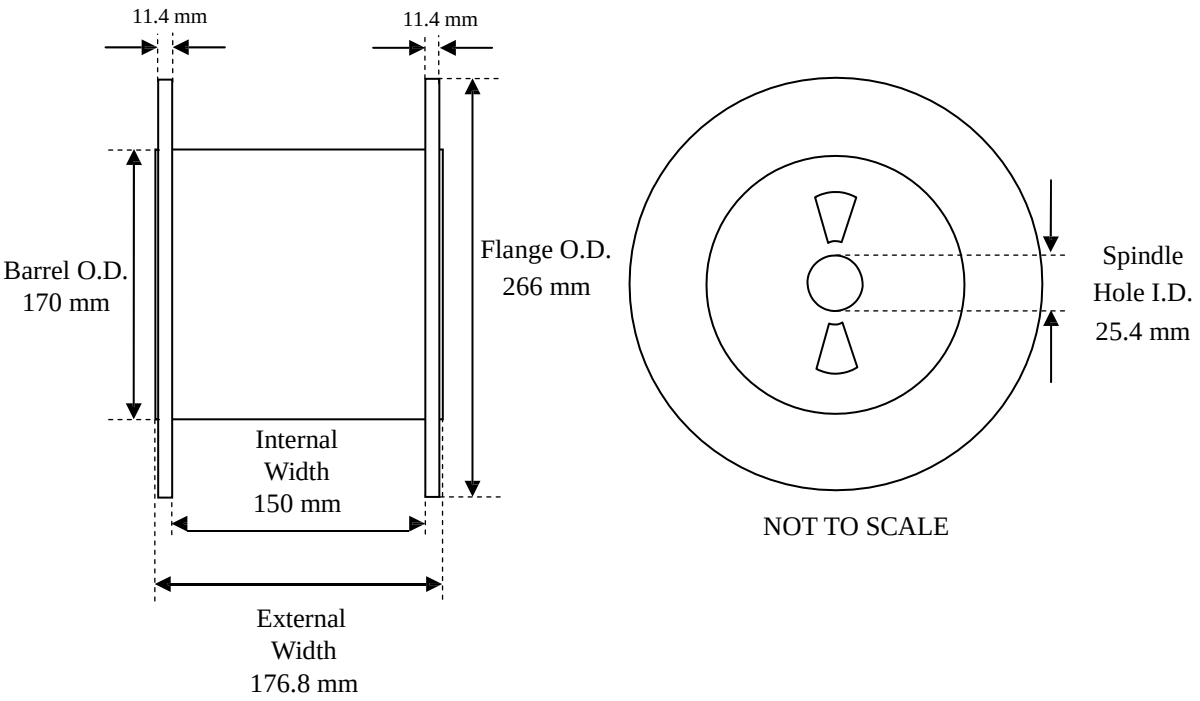

Fig. 5. Fiber Reel (for 50.4 km)

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