GAON CABLE CO., LTD.
CERTIFIED TO ISO 9001:2015
200001098 TLR6

GAON CABLE CO., LTD.
CERTIFIED TO ISO 14001:2015
200001098 UM15

Specification

GF ABC-001

For

Loose Tube / Dry core / Single Jacket Air Blown Optical Fiber Cable

[GAON code : OJFPP-LT/ABC]
[Optical Fiber based on SM]

Rev.	Date	Prepared	Checked	Approved	Remark
00	Jun. 18. 2020	B.S. Jang	C.S. Kim	Y.C. Park	Issue
01	Oct. 19, 2020	B.S. Jang	C.S. Kim	Y.C. Park	Chage Temp range, Add 288C(HD)

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1. Scope

1.1 Application

This specification covers the general requirements for the optical fiber telecom. The cable intended for outdoor applications installed in microduct by air blown method.

1.2 Cable Description

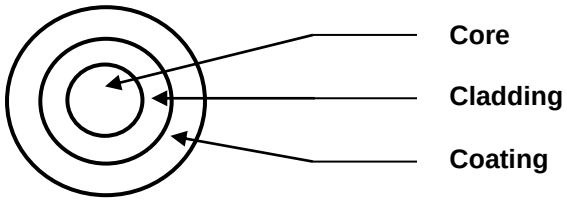
The cable core consist of color coded fibers, thixotropic jelly filled, color coded loose tubes, Filler(if necessary), SZ-stranded around the dielectric central strength member with water blocking yarn(s).

Non-Armor / Single Jacket

The cable structure is completed by the application of core binder yarn(s), which with the core, are covered by an outer PE jacket.

2. Optical Fiber

2.1 Construction of the fibers



2.2 The operating wavelength region of single-mode is 1310, 1383, 1550nm

2.3 Material of the Fibers

The fiber shall be made from high grade silica glasses and the coating shall be made from UV curable acrylate material. A protective UV cured acrylate coating shall be applied over the fiber cladding and it shall be able to removed mechanically or chemically.

- Core : Silica (SiO2) Doped with Germanium Dioxide (GeO2)
- Cladding : Silica (SiO2)
- Coating : Dual Layers of UV curable acrylate (or equivalent)

2.4 Environmental conditions ; Temperature & Humidity

- Operation : - 30 to +70 ℃(- 40 to 158℉)
- Installation : - 10 to +60 ℃(14 to 140℉)
- Storage : - 30 to +70 ℃(- 40 to 158℉)

2.5 The optical, geometrical and mechanical performance of the optical fiber shall be in accordance with Table 1 (below).

Table 1 Characteristics for SM fiber (optical, geometrical & mechanical performance)

Items	Unit	Specification	
Type of Fiber		ITU-T G.652D	ITU-T G.657A1
Mode Field Diameter (@1310nm)	um	9.2 ± 0.4	8.9 ± 0.4
Attenuation co-efficient	dB/km	≤ 0.35 @ 1310 nm ≤ 0.35 @ 1383 nm ≤ 0.25 @ 1550 nm	
Chromatic Dispersion	ps/nm.km	≤ 3.5 @ 1285~1330 nm ≤ 18 @ 1550 nm	
Zero Dispersion Wavelength	nm	1300 ~ 1324	
Zero Dispersion Slope	$ps/nm^2.km$	≤ 0.092	
Cut-off Wavelength (λcc, cabled fiber)	nm	≤ 1260	
Mode field Concentricity Error	um	≤ 0.6	
Cladding Diameter	um	125 ± 1.0	
Cladding Non-circularity	%	≤ 1.0	
Coating Diameter	um	250 ± 15	
Proof test (Nom)	kpsi	100	

3. Cable Construction

3.1 The construction of the cable shall be in accordance with Table 2 (below).

Table 2-1 Construction of the cable

Items	Description
Fiber type	See Table 1
No. of fibers	Max. 288
Loose buffer tube	Made of PBTP (Polybutylene Terephthalate)
Type of inner jelly	Thixotropic type Jelly Compound (in L/T)
Filler	Natural color PE rod(s) If necessary, the Filler use for a circular-section core. (To make good core configuration)
Central strength member	FRP (If necessary, PE coating)
Water blocking material	Water blocking yarn(s) around the CSM (To prevent the ingress of water)
S-Z Stranding (Cable core)	The required numbers of loose tube and filler rod are S-Z stranded tightly around the CSM.
Core binder yarn	Water blocking core binder yarn(s)
Ripcord	One rip cord (To provide easy cable entry)
Outer jacket	Black colored PE

Table 2-2 Construction of the cable in detail

Items	Description										
Cable type	Standard (SD), Micro (MC)						Micro (MC)		High density (HD)		
No. of fibers	12	24	36	48	60	72	96	144	96	144	288
No. of fibers per tube	12	12	12	12	12	12	12	12	24	24	24
No. of loose tube	1	2	3	4	5	6	8	12	4	6	12
No. of filler	5	4	3	2	1	0	0	0	2	0	0
Loose tube diameter (Nom. mm)	1.7 (SD), 1.45 (MC)						1.45		2.2		
Cable diameter	See Appendix 2										
Cable weight	See Appendix 2										

4. Fiber & Loose tube Identification

4.1 The color code of the loose tubes and the individual fibers within each loose tube shall be accordance with Table 3 (below).

Table 3-1 Color code of the fibers

No	Color	No	Color
1	Blue	13	Blue + Single dot marking
2	Orange	14	Orange + Single dot marking
3	Green	15	Green + Single dot marking
4	Brown	16	Brown + Single dot marking
5	Gray	17	Gray + Single dot marking
6	White	18	White + Single dot marking
7	Red	19	Red + Single dot marking
8	Black	20	Natural + Single dot marking
9	Yellow	21	Yellow + Single dot marking
10	Violet	22	Violet + Single dot marking
11	Pink	23	Pink + Single dot marking
12	Aqua	24	Aqua + Single dot marking

Table 3-2 Color code of the loose buffer tubes

No	Color	No	Color
1	Blue	7	Red
2	Orange	8	Black
3	Green	9	Yellow
4	Brown	10	Violet
5	Gray	11	Pink
6	White	12	Aqua

5. Mechanical / Environmental Performance & Tests

5.1 The mechanical & environmental performance of the cable shall be in accordance with Table 4 (below). Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550nm for SM. The measurement equipment error can be occurred in range of 0.02dB.

Table 4 Mechanical & Environmental Performance of the cable

Items	Description
Tensile Strength	● Test method : IEC 60794-1-2 Method E1 -. Mandrel diameter : 40D (D : Cable diameter) -. Length under tension : ≥ 50 m -. Applied Tensile load : 1W (W : Cable weight) -. Duration of loading : 1hour ● Acceptance criteria -. Attenuation increment : Reversible, after test
Crush Resistance (Compressive loading)	● Test method : IEC 60794-1-2 Method E3 -. Applied load : 500N -. No of points : 1 point -. Plate size : 100mm x 100mm -. Duration of loading : 1min. ● Acceptance criteria -. Attenuation increment : Reversible, after test
Impact resistance	● Test method : IEC 60794-1-2 Method E4 -. Applied energy : 1J -. Striking surface radius : 300mm -. No. of impact per point : 3points(500mm interval) ● Acceptance criteria -. Attenuation increment : ≤0.1 dB, after test
Repeated bend	● Test method : IEC 60794-1-2 Method E6 -. Bend radius: 20D (D : Cable diameter) -. Applied load : 50N -. Bend angle : ±90 degree -. No. of cycles : 25 cycles ● Acceptance criteria -. No damage to the sheath and to the cable elements
Torsion	● Test method : IEC 60794-1-2 Method E7 -. Cable twisted length : 2 m -. No. of twist cycles : 10 cycles -. Applied load : 50N -. Twist angle : ±180 degree ● Acceptance criteria -. Attenuation increment : Reversible, after test

Kink	● Test method : IEC 60794-1-2 Method E10 -. Mandrel diameter : 40D (D : Cable diameter) ● Acceptance criteria -. No kink
Cable bend	● Test method : IEC 60794-1-2 Method E11A -. Mandrel dia.: 20D (D : Cable diameter) -. Bend angle : ±180 degree -. No. of turns : 4 turns ● Acceptance criteria -. Attenuation increment : Reversible, after test
Temperature Cycling	● Test method : IEC 60794-1-2 Method F1 -. Cable length : ≥ 1000m -. Test condition : ≥ 2 fibers shall be spliced -. Temperature cycling schedule (Step1) +23℃→-15℃→+30℃→+60℃→+23℃ Soak time : 8hours/step -. No. of cycles : 2 ● Acceptance criteria -. Attenuation increment : Reversible, after test (Measure during the last cycle)
Water penetration	● Test method : IEC 60794-1-2 Method F5 -. Length of specimen : 3 m -. Height of pressure head : 1 m -. Test time : 24 h ● Acceptance criteria -. No leakage through the open cable end

6. Packing and marking

6.1 Cable marking

The jacket shall be marked at intervals of one meter or two feet with following information.

1) Cable type & counts
2) Name of the manufacturer
3) Year of manufacture (****)
4) Serial number (####, 4digits or 5digits)
5) Length marking

Ex) For SM 144 fiber cable (High density (HD))

0000m OJFPP-LT/ABC/HD SM 144C GAON **** #### 0001m

6.2 Cable packing

6.2.1 Standard length of cable shall be 2000 m. Other cable length is also available if required by customer.
6.2.2 Each length of the cable shall be shall be wound on a separate wooden reel.
6.2.3 Both ends of the cable shall be sealed with a suitable plastic cap to prevent the entry of moisture during shipping, handling and storage.
6.2.4 The cable ends shall be securely fastened to the reel to prevent the cable from becoming loose in transit or during placing operations.
6.2.5 The inner end of the cable is housed into a slot on the side of the reel without extra cable length for testing.
6.2.6 The reels must have a number of rotations that there is a min. free space of 50mm between the upper layer and the edge of the flanges.
6.2.7 Circumference battens or Wood-fiber board shall be secured with steel band to protect the cable during normal handling and storage.

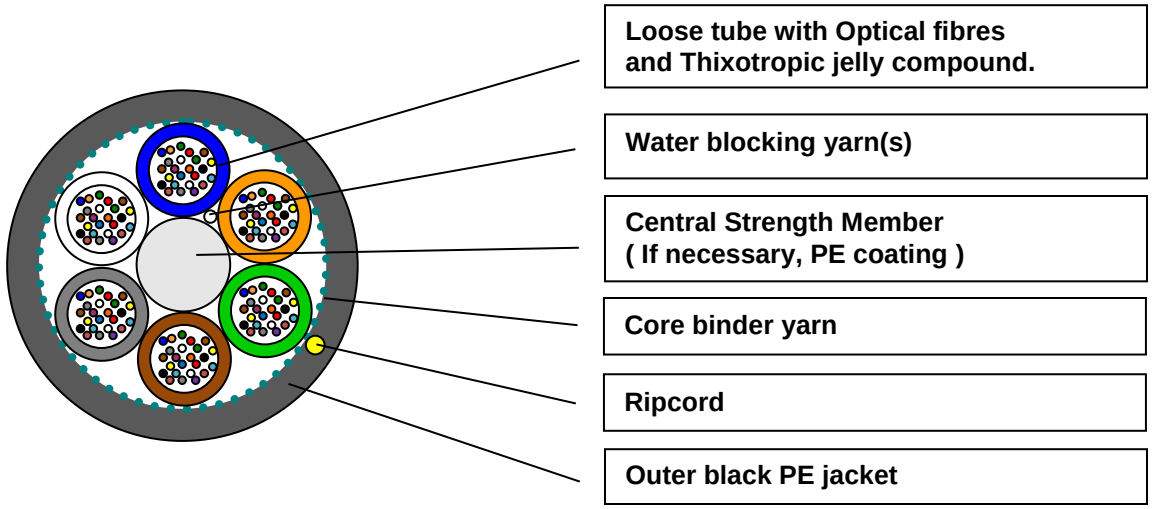
6.3 Cable reel

6.3.1 Details given below shall be distinctly marked on a weather proof materials on both outer sides of the reel flange ;
1) Customer's name
2) Contract Number
3) Type & fiber counts of cable
4) Length of cable in meter
5) Drum number
6) Gross & Net weight in kilograms
7) Year of manufacture
8) Name of the manufacturer
9) Arrow showing the direction the drum shall be rolled
* Other shipping mark is also available if required by customer.

6.3.2 The cable shall be wound on the reel designed to prevent damages during shipment and installation.
6.3.3 The minimum barrel diameter of the cable drums shall be at least 40 times the overall cable diameter.
6.3.4 The arbor holes provided in the reels shall be 75 ~ 125 mm in diameter. The arbor hole on each flange shall be reinforced with a bearing plate.

Appendix 1

(Cable Cross-Sectional Make-up)
(Drawing not to scale)
(OJFPP-LT/ABC/HD Type 144 Fiber / High density)



"The drawing appearing on this page may be subject to change or modification without any prior notice"

Appendix 2

Diameter, Weight & Min. Bending radius

Type	No. of Fiber	Tube position	No. of fiber per tube	Cable diameter (Nom. mm)	Cable weight (Nom. kg/km)	Min. Bending Radius	
						No Load	Under Load
Standard (SD)	~72	6	12	6.5 (0.256inch)	35 (24lbs/kft)	10D	20D
Micro (MC)	~72	6	12	5.5 (0.217inch)	25 (16lbs/kft)	10D	20D
	96	8	12	6.5 (0.256inch)	35 (25lbs/kft)	10D	20D
	144	12	12	8.0 (0.315inch)	55 (37lbs/kft)	10D	20D
High density (HD)	~144	6	24	8.0 (0.315inch)	50 (34lbs/kft)	10D	20D
	~288	12	24	12.5 (0.492inch)	125 (84lbs/kft)	10D	20D

- **Actual values for cable weight and diameter may deviate from the calculated values given in the table above.**