

FURUKAWA ELECTRIC  
INDUSTRIAL CABLE CO., LTD.

Spec. No. CGS-14008

**SPECIFICATION**  
FOR  
Marine Optical Fiber Cable  
for halogen-free thermoplastic compound type

## 1. SCOPE

This specification covers the requirements for the flame retardant optical cables in ships and mobile offshore units for telecommunication applications.

## 2. STANDARDS AND REGULATIONS

Unless otherwise specified, all cables shall be in accordance with all applicable section of the latest editions of the following Codes, Standards and Regulations, and their current amendments.

Std./Reg.	Designation Title	Reference
International Electrotechnical Commission(IEC)	Optical fibers, Generic specification	IEC 60793-1
	Optical fibers, Product specification	IEC 60793-2
	Optical fiber cables, Generic specification	IEC 60794-1-1
	Optical fiber cables, Product specification	IEC 60794-1-2
	General Construction and Test requirements of low-voltage shipboard power cables	IEC 60092-350
	Single and Multicore cables with extruded solid insulation for rated voltages 0.6/1 kV	IEC 60092-353
	Sheath materials for shipboard power and telecommunication cables	IEC 60092-359
	Tests on Optical fiber cables under fire conditions Part 1 : Test on a single vertical insulated cable	IEC 60332-1
	Tests on Optical fiber cables under fire conditions Part 3-22 : Test for vertical flame spread of vertically -mounted bunched wires or cables - Category A	IEC 60332-3-22
	Test on gases evolved during combustion of materials from cables	IEC 60754-1&2
Measurement of smoke density of electric cables burning under defined conditions	IEC 61034-1&2	
Norwegian National Committee	Cable for offshore installations halogen free and/or mud resistant	NEK606
International Tele-communication Union	Characteristics of a single-mode optical fiber	ITU-T G.652
	Characteristics of a multi mode optical fiber	ITU-T G.651

### 3. CABLE TYPE AND SYMBOLS

Table 1. Types of Cables

Cable Type	Fiber Type	Number of Fiber	Buffer Type	Armour	Outer Sheath	Designation
Flame-Retardant	SM(9/125) G.652.D	2~12C	Tight Buffer	Bronze* Galvanized steel wire*	Low-smoke zero-halogen Polyolefine (SHF1)	<b>AIBI*</b> <b>AICI*</b>
	SM(8/125) G.657.A					
	MM(50/125)					
	MM(50/125) 1G					
	MM(62.5/125)					
	MM(62.5/125) 1G					

\* The wire braid for armor may be changed with galvanized steel wire or bronze wire when purchaser required.

Table 2. Symbols of Cable Code

Part 1		Part 2		Part 3		Part 4	
OF02		50/125-G		AICI		FA	
Part 1							
OF		Optical Fiber Cable					
##		Number of Fibers					
Part 2							
50/125		Dimension of fiber core/cladding					
G		1Gigabite					
Part 3							
Fiber Protection		Inner Sheath		Armour		Outer Sheath	
A	Tight Buffer	I	SHF1 Halogen-free, thermoplastic compound	O	Tinned copper	I	SHF1 Halogen-free, thermoplastic compound
				C*	Galvanized steel		
Q	Loose Tube	F	Inner Covering HFC/SHF1/SHF2/SHFMud Halogen free Compound	B*	Bronze	U	SHF Mud Halogen-free, mud resistant thermoset compound
Part 4							
FA		Flame retardant					
FI		Fire resistance					
FM		Fire and Mud resistance					

\* The symbol of armour can be changed when the material of armour is changed

## 4. CONSTRUCTION & IDENTIFICATION

The specification covers the general and construction requirements for the optical cables for ships and mobile offshore units. The optical fiber shall be a buffered fibers and surrounded with one layer of reinforcing aramid yarn. The colored jacket shall be extruded over the aramid yarn(SUB-UNIT: SIMPLEX CABLE). The cable core shall be stranded with two or several simplex units(If necessary fillers). The cable shall be the double jacket with bronze armored cable.

### 4.1. OPTICAL FIBER

The optical fiber shall be a glass fiber that carries light along its length. It shall be composed of core, cladding and two layers of coating. Optical fibers shall meet the requirements of IEC 60793-1 and 60793-2.

### 4.2. TIGHT BUFFER

The tight buffer shall consist of an extruded layer of halogen free thermoplastic compound. As a rule, the color of tight buffer shall be "Yellow" in SMF, "Orange" in MMF(50/125) and "Grey" in MMF(62.5/125). The other color of buffer may be applicable when purchaser required.

### 4.3. SUB-UNITS(Simplex)

The sub-units(simplex) shall consist of an extruded layer of halogen free thermoplastic compound. A strength member may be applied in the inner sheath for reinforcing. Color and Identification of sub-unit cable

1) Color :

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

2) Numbering :

	No.1	No.2	No.3	No.4	No.5	No.6
Marking	#1	#2	#3	#4	#5	#6
Sub-unit	No.7	No.8	No.9	No.10	No.11	No.12
Marking	#7	#8	#9	#10	#11	#12

In case of number printing on the simplex, the interval of numbers shall be 30cm or more. The color of simplex shall be one color in above table. The other color of simplex may be applicable when purchaser required.

### 4.4. CABLING

The required number of cores shall be cabled together with suitable lay length. A suitable filler may be applied to center and suitable layer. Suitable tape(s) may be applied on the cabled core.

### 4.5. INNER SHEATH

The sheath shall be an extruded layer of halogen free thermoplastic compound(SHF1) and comply with requirements of designation SHF1 in IEC 60092-359. A strength member may be applied in the inner sheath for reinforcing. The average thickness of the inner sheath shall be not less than the specified nominal value given in the table. As a rule, the color of inner sheath shall be "Black". The other color of sheath may be applicable when purchaser required.

#### 4.6. ARMOUR

The armour shall be braided bronze wires. The wire braid for armour may be changed with galvanized steel or tinned annealed copper wire when purchaser required. The coverage density of braid shall be not less than 90% when tested by clause 11.6 (b) of IEC 60092-350. Suitable tape(s) may be applied on the armour.

#### 4.7. OUTER SHEATH

The sheath shall be an extruded layer of halogen free thermoplastic compound(SHF1) and comply with requirements of designation SHF1 in IEC 60092-359.

The average thickness of the outer sheath shall be not less than the specified nominal value given in the table. As a rule, the color of outer sheath shall be "Black".

The other color of sheath may be applicable when purchaser required.

### 5. TEST

The following test shall be carried out in accordance with IEC 60092-350, IEC 60092-353, IEC 60794-1-2 and this specification.

#### 5.1. ROUTINE TEST

Routine tests shall be carried out all cables manufactured and shall be in accordance with specified standards.

5.1.1. Measurement of thickness of sheath test per clause 13.2 of IEC 60092-350

5.1.2. Measurement of attenuation of optical cable per method C of IEC 60793-1-40

Properties	Wavelength	SM	MM
Attenuation	1310nm	Max 0.40dB/km	NA
	1550nm	Max 0.30dB/km	NA
	850nm	NA	Max 3.5dB/km
	1300nm	NA	Max 1.5dB/km

#### 5.2. SPECIAL TEST

The following special test shall be carried out in accordance with specified standards.

5.2.1. Oxygen index test (for only sheathing material)

The test shall be carried out in accordance with ASTM D 2863.

The minimum oxygen index shall be 32 for sheath.

### 5.3. TYPE TEST

The following type test shall be carried out in accordance with specified standards.

5.3.1. Characteristics of sheath test per clause 13.4, 13.7, 13.8, 13.9, 13.18 of IEC 60092-350.

5.3.2. Tensile strength test per IEC 60794-1-2-E1.

The test shall examine the behavior of the attenuation and fiber strain for the cable on load.

Type	Test	SMF (at 1550nm)	MMF (at 1300nm)	Fiber strain
Installation	Change in attenuation	0dB after test	0dB after test	Max. 0.5%
Operation		0.2dB during test	0.5dB during test	Max. 0.33%
		0dB after test	0dB after test	

Measurement error cover  $\pm 0.02\text{dB}$  (as same below test)

5.3.3. Crush test per IEC 60794-1-2-E3

Conditions	Test	SMF (at 1550nm)	MMF (at 1300nm)
Load <sub>max</sub> = 1,000N 5min., 3point	Change in attenuation	0.2dB during test	0.5dB during test
		0dB after test	0dB after test

5.3.4. Impact test per IEC 60794-1-2-E4

Conditions	Test	SMF (at 1550nm)	MMF (at 1300nm)
<u>15J, 3impact</u> 3point	Change in attenuation	0.2dB after test	0.5dB after test

5.3.5. Repeated bending test per IEC 60794-1-2-E6

Conditions	Test	SMF (at 1550nm)	MMF (at 1300nm)
100N, 500 bend cycles <u>bending radius = 10x diam.</u>	Change in attenuation	0dB after test	0dB after test

5.3.6. Torsion test per IEC 60794-1-2-E7

Conditions	Test	SMF (at 1550nm)	MMF (at 1300nm)
$\pm 180^\circ$ , 1m, 20cycles tension given in table I	Change in attenuation	0dB after test	0dB after test

5.3.7. Kink test per IEC 60794-1-2-E10

No kink shall occur at minimum bending diameter

5.3.8. Cable bend test per IEC 60794-1-2-E11

Conditions	Test	SMF (at 1550nm)	MMF (at 1300nm)
$\pm 5$ turns, 3 cycles	Change in attenuation	0.2dB during test	0.5dB during test
		0dB after test	0dB after test

### 5.3.9. Cold bend test

Conditions	Test	SMF (at 1550nm)	MMF (at 1300nm)
±5 turns, 3 cycles <u>minimum operation temp.</u>	Change in attenuation	0.2dB during test	0.5dB during test
		0dB after test	0dB after test

No breakage to the sheath or to the cable element

### 5.3.10. Water penetration test per IEC 60794-1-2-F5

Test for water migration over the entire cross-section designed to be water-blocked.  
Before the test starts, armour and outer sheath is removed.

### 5.3.11. Temperature cycling test per IEC 60794-1-2-F1

Conditions	Test	SMF (at 1550nm)	MMF (at 1300nm)
<u>+20°C(4hrs) → -40°C(4hrs) → +70°C(4hrs) → -40°C(4hrs) → +70°C(4hrs) → +20°C(4hrs)</u>	Change in attenuation	0.2dB after test	0.5dB after test

### 5.3.12. Flame retardant test per IEC 60332-1.

### 5.3.13. Flame retardant test per IEC 60332-3-22 Category A.

### 5.3.14. Content of halogen test per IEC 60754-1.

The maximum content of halogen shall be as follows :  
Inner sheath and outer sheath : 0.5% (5mg/g)

### 5.3.15. Smoke emission test per IEC 61034-2.

The minimum value shall be 60%.

## 6. CABLE MARKING

The cable shall be marked at interval of at least 1meter with following informations.  
The other information can be added in marking when purchaser required.

- 6.1 Manufacturer's name or trade mark
- 6.2 Cable designation, Fiber type, Diameter or Fiber Count
- 6.3 Manufacture year
- 6.4 Length marking
- 6.5 Serial No.
- 6.6 Others

## 7. MARKING ON DRUM

On a flange of the drum, necessary information such as manufacturer's name, cable type, size, length of cable, drum no., gross weight, net weight, etc. shall be printed.

## 8. PACKING

Each length of the finished cable shall be wound on the wooden drum so completely as not to be damaged during transportation. The both ends of the cable shall be sealed with a suitable plastic cap to prevent the entry of moisture during shipping, handling and storage.

**TABLE 3**  
**CHARACTERISTICS OF SHEATH & PROTECTIVE COVERING(Comply with IEC 60092-359)**

Materials			SHF1
Mechanical characteristics			
Without aging			
Tensile strength	Minimum	N/mm <sup>2</sup>	9.0
Elongation at break	Minimum	%	120
After aging in air oven			
Temperature		°C	100±2
Duration		hours	168
Tensile strength			
a) Minimum value		N/mm <sup>2</sup>	7.0
b) Variation	Maximum	%	±30
c) Percentage of value found on the unaged specimen	Minimum	%	-
Elongation at break			
a) Minimum value		%	110
b) Variation	Maximum	%	±30
c) Percentage of value found on the unaged specimen	Minimum	%	-
Particular characteristics			
Pressure test at high temperature			
Temperature		°C	80±2
Duration under load			
- for cable having an outer diameter < 12.5mm		hours	4
- for cable having an outer diameter > 12.5mm		hours	6
Maximum permissible deformation		%	50
Heat shock test			
Temperature		°C	150±3
Duration		hours	1
Result of heat shock test			No crack



**TABLE 3**  
**CHARACTERISTICS OF SHEATH & PROTECTIVE COVERING(Cont.)**

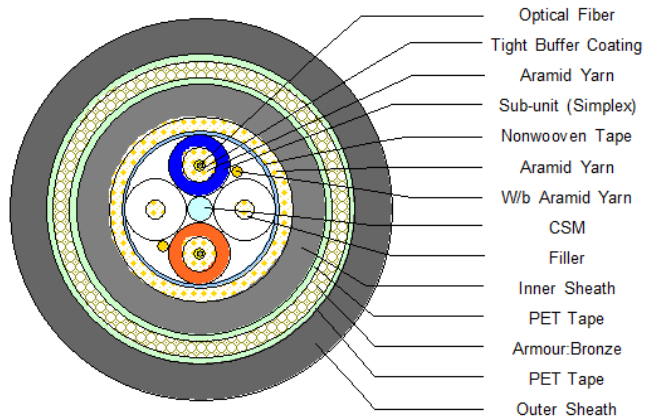
Materials			SHF1
Behaviour at low temperatures			
Bending test (for cables with outer diameter upto and including 12.5mm)			
Temperature		°C	-15±2
Duration		hours	16
Result of bending test			No crack
Elongation test (for cables not subjected to the bending test)			
Temperature		°C	-15±2
Duration		hours	4
Elongation at rupture	Minimum	%	20
Cold impact			
Temperature		°C	-15±2
Duration		hours	16
Result of cold impact test			No crack
Amount of halogen acid gas	Maximum	mg/g(%)	5(0.5)
Smoke light transmittance	Minimum	%	60
Oxygen index	Minimum		32

## Attachment 1

### CABLE TYPE : Flame retardant 2C : AIBI

Cable Code	Fiber Cont.	Buffer Dia. (μm)	Simplex Dia. (mm)	Inner		Outer Sheath		Core Dia. (μm)	Clad Dia. (μm)	Coat Dia. (μm)	Dispersion (ps/km-nm)		Approx. Cable Weight (kg/km)	CSM Dia. (mm)	Tensile Load (N)		Min. Bend Radi. (mm)	Attenuation (dB/km)		Bandwidth (Mhz.km)		Link Dist. (m)
				Thick. (mm)	Dia. (mm)	1290~1330(nm)	1550(nm)				Install ing	Opera ting			850/1310(nm)	1300/1550(nm)		850(nm)	1300(nm)	1300(nm)		
OF02-9/125-AIBI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	9.2±0.4	125±1	242±7	3.0↓	18↓	190	1.0±0.2	600	500	123	0.4	0.3	N/A	N/A	N/A	
OF02-8/125-AIBI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	8.6±0.4	125±1	242±7	3.0↓	17.5↓	190	1.0±0.2	600	500	123	0.4	0.3	N/A	N/A	N/A	
OF02-50/125-AIBI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	50±2.5	125±1	245±7	N/A	N/A	190	1.0±0.2	600	500	123	3.5	1.5	400	800	550	
OF02-50/125-G-AIBI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	50±2.5	125±1	245±7	N/A	N/A	190	1.0±0.2	600	500	123	3.5	1.5	400	800	2,000	
OF02-62.5/125-AIBI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	190	1.0±0.2	600	500	123	3.5	1.5	160	500	550	
OF02-62.5/125-G-AIBI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	190	1.0±0.2	600	500	123	3.5	1.5	160	500	1,000	

### Construction



\* Temperature range(°C)

1. Installing

: -10 ~ +60

2. Operating

: -40 ~ +70

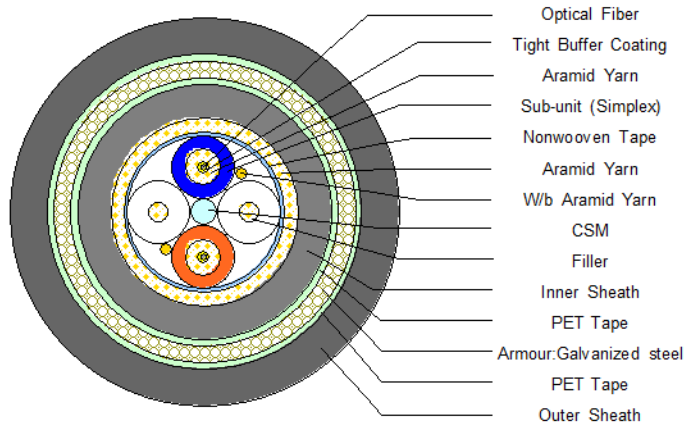
\* Flame-retardant (IEC 60332-1&3 CAT.A)

## Attachment 2

### CABLE TYPE : Flame retardant 2C : AICI

Cable Code	Fiber Cont.	Buffer Dia. (μm)	Simplex Dia. (mm)	Inner		Outer Sheath		Core Dia. (μm)	Clad Dia. (μm)	Coat Dia. (μm)	Dispersion (ps/km-nm)		Approx. Cable Weight (kg/km)	CSM Dia. (mm)	Tensile Load (N)		Min. Bend Radi. (mm)	Attenuation (dB/km)		Bandwidth (Mhz.km)		Link Dist. (m)
				Thick. (mm)	Dia. (mm)	1290~1330(nm)	1550(nm)				Install ing	Opera ting			850/1310(nm)	1300/1550(nm)		850(nm)	1300(nm)	1300(nm)		
OF02-9/125-AICI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	9.2±0.4	125±1	242±7	3.0↓	18↓	185	1.0±0.2	600	500	123	0.4	0.3	N/A	N/A	N/A	
OF02-8/125-AICI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	8.6±0.4	125±1	242±7	3.0↓	17.5↓	185	1.0±0.2	600	500	123	0.4	0.3	N/A	N/A	N/A	
OF02-50/125-AICI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	50±2.5	125±1	245±7	N/A	N/A	185	1.0±0.2	600	500	123	3.5	1.5	400	800	550	
OF02-50/125-G-AICI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	50±2.5	125±1	245±7	N/A	N/A	185	1.0±0.2	600	500	123	3.5	1.5	400	800	2,000	
OF02-62.5/125-AICI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	185	1.0±0.2	600	500	123	3.5	1.5	160	500	550	
OF02-62.5/125-G-AICI-FA	2	900±50	2.0±0.2	1.1	1.3	12.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	185	1.0±0.2	600	500	123	3.5	1.5	160	500	1,000	

### Construction



\* Temperature range(°C)

1. Installing

: -10 ~ +60

2. Operating

: -40 ~ +70

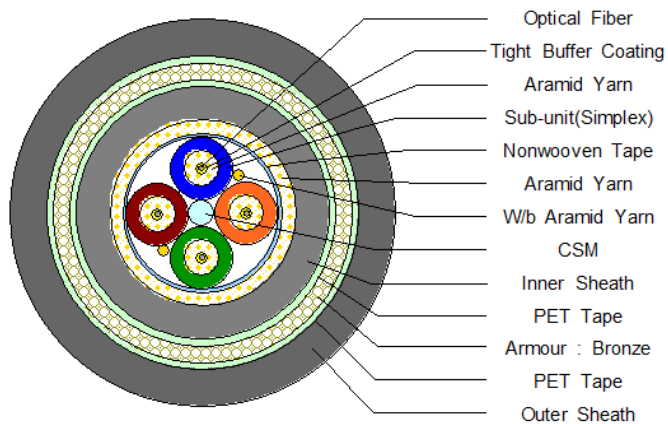
\* Flame-retardant (IEC 60332-1&3 CAT.A)

### Attachment 3

#### CABLE TYPE : Flame retardant 4C : AIBI

Cable Code	Fiber Cont.	Buffer Dia. (μm)	Simplex Dia. (mm)	Inner		Outer Sheath		Core Dia. (μm)	Clad Dia. (μm)	Coat Dia. (μm)	Dispersion (ps/km-nm)		Approx. Cable Weight (kg/km)	CSM Dia. (mm)	Tensile Load (N)		Min. Bend Radi. (mm)	Attenuation (dB/km)		Bandwidth (Mhz.km)		Link Dist. (m)
				Thick. (mm)	Dia. (mm)	1290~1330(nm)	1550(nm)				Install ing	Opera ting			850/1310(nm)	1300/1550(nm)		850(nm)	1300(nm)	1300(nm)		
OF04-9/125-AIBI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	9.2±0.4	125±1	242±7	3.0↓	18↓	190	1.0±0.2	600	500	123	0.4	0.3	N/A	N/A	N/A	
OF04-8/125-AIBI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	8.6±0.4	125±1	242±7	3.0↓	17.5↓	190	1.0±0.2	600	500	123	0.4	0.3	N/A	N/A	N/A	
OF04-50/125-AIBI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	50±2.5	125±1	245±7	N/A	N/A	190	1.0±0.2	600	500	123	3.5	1.5	400	800	550	
OF04-50/125-G-AIBI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	50±2.5	125±1	245±7	N/A	N/A	190	1.0±0.2	600	500	123	3.5	1.5	400	800	2,000	
OF04-62.5/125-AIBI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	190	1.0±0.2	600	500	123	3.5	1.5	160	500	550	
OF04-62.5/125-G-AIBI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	190	1.0±0.2	600	500	123	3.5	1.5	160	500	1,000	

#### Construction



\* Temperature range(°C)

1. Installing

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2. Operating

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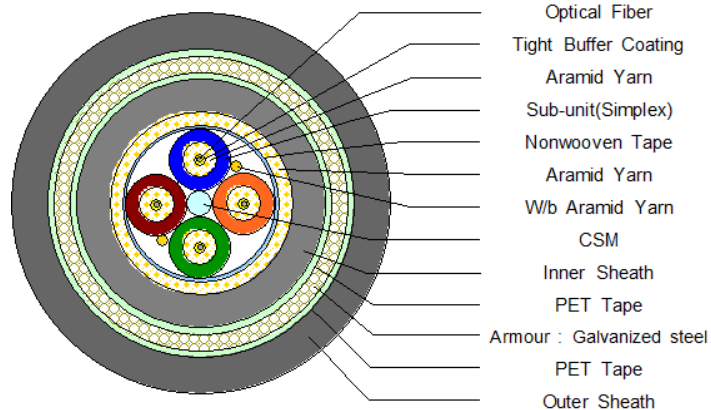
\* Flame-retardant (IEC 60332-1&3 CAT.A)

## Attachment 4

### CABLE TYPE : Flame retardant 4C : AICI

Cable Code	Fiber Cont.	Buffer Dia. (μm)	Simplex Dia. (mm)	Inner		Outer Sheath		Core Dia. (μm)	Clad Dia. (μm)	Coat Dia. (μm)	Dispersion (ps/km-nm)		Approx. Cable Weight (kg/km)	CSM Dia. (mm)	Tensile Load (N)		Min. Bend Radi. (mm)	Attenuation (dB/km)		Bandwidth (Mhz.km)		Link Dist. (m)
				Thick. (mm)	Dia. (mm)	1290~1330(nm)	1550(nm)				Installing	Operating			850/1310(nm)	1300/1550(nm)		850(nm)	1300(nm)	1300(nm)		
OF04-9/125-AICI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	9.2±0.4	125±1	242±7	3.0↓	18↓	185	1.0±0.2	600	500	123	0.4	0.3	N/A	N/A	N/A	
OF04-8/125-AICI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	8.6±0.4	125±1	242±7	3.0↓	17.5↓	185	1.0±0.2	600	500	123	0.4	0.3	N/A	N/A	N/A	
OF04-50/125-AICI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	50±2.5	125±1	245±7	N/A	N/A	185	1.0±0.2	600	500	123	3.5	1.5	400	800	550	
OF04-50/125-G-AICI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	50±2.5	125±1	245±7	N/A	N/A	185	1.0±0.2	600	500	123	3.5	1.5	400	800	2,000	
OF04-62.5/125-AICI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	185	1.0±0.2	600	500	123	3.5	1.5	160	500	550	
OF04-62.5/125-G-AICI-FA	4	900±50	2.0±0.2	1.1	1.3	12.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	185	1.0±0.2	600	500	123	3.5	1.5	160	500	1,000	

### Construction



\* Temperature range(°C)

1. Installing

: -10 ~ +60

2. Operating

: -40 ~ +70

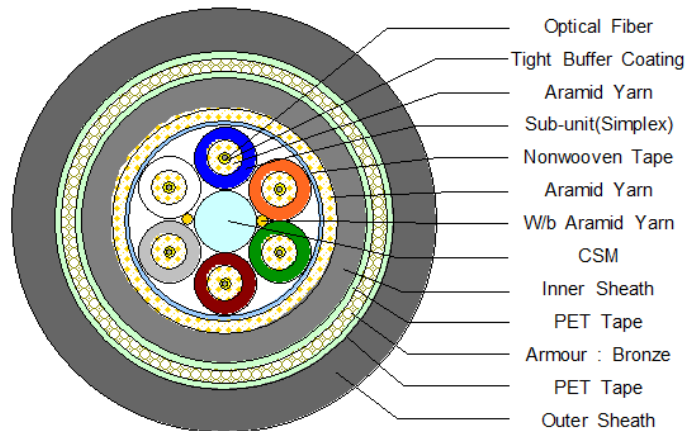
\* Flame-retardant (IEC 60332-1&3 CAT.A)

## Attachment 5

### CABLE TYPE : Flame retardant 6C : AIBI

Cable Code	Fiber Cont.	Buffer Dia. (μm)	Simplex Dia. (mm)	Inner		Outer Sheath		Core Dia. (μm)	Clad Dia. (μm)	Coat Dia. (μm)	Dispersion (ps/km-nm)		Approx. Cable Weight (kg/km)	CSM Dia. (mm)	Tensile Load (N)		Min. Bend Radi. (mm)	Attenuation (dB/km)		Bandwidth (Mhz.km)		Link Dist. (m)
				Thick. (mm)	Dia. (mm)	1290~1330(nm)	1550(nm)				Installing	Operating			850/1310(nm)	1300/1550(nm)		850(nm)	1300(nm)	1300(nm)		
OF06-9/125-AIBI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	9.2±0.4	125±1	242±7	3.0↓	18↓	220	2.0±0.3	600	500	133	0.4	0.3	N/A	N/A	N/A	
OF06-8/125-AIBI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	8.6±0.4	125±1	242±7	3.0↓	17.5↓	220	2.0±0.3	600	500	133	0.4	0.3	N/A	N/A	N/A	
OF06-50/125-AIBI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	50±2.5	125±1	245±7	N/A	N/A	220	2.0±0.3	600	500	133	3.5	1.5	400	800	550	
OF06-50/125-G-AIBI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	50±2.5	125±1	245±7	N/A	N/A	220	2.0±0.3	600	500	133	3.5	1.5	400	800	2,000	
OF06-62.5/125-AIBI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	220	2.0±0.3	600	500	133	3.5	1.5	160	500	550	
OF06-62.5/125-G-AIBI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	220	2.0±0.3	600	500	133	3.5	1.5	160	500	1,000	

### Construction



\* Temperature range(°C)

1. Installing

: -10 ~ +60

2. Operating

: -40 ~ +70

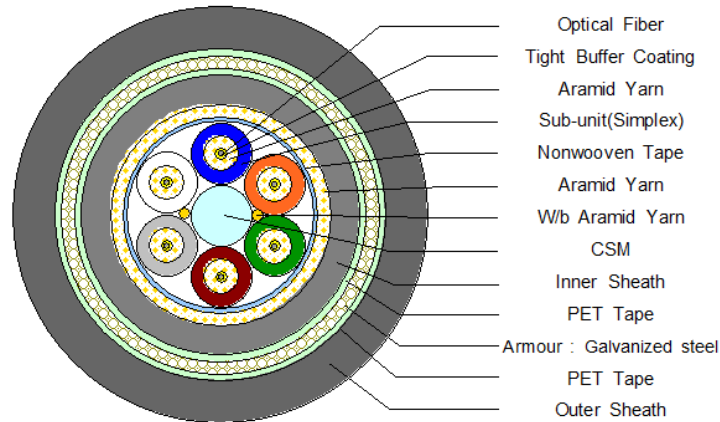
\* Flame-retardant (IEC 60332-1&3 CAT.A)

## Attachment 6

### CABLE TYPE : Flame retardant 6C : AICI

Cable Code	Fiber Cont.	Buffer Dia. (μm)	Simplex Dia. (mm)	Inner		Outer Sheath		Core Dia. (μm)	Clad Dia. (μm)	Coat Dia. (μm)	Dispersion (ps/km-nm)		Approx. Cable Weight (kg/km)	CSM Dia. (mm)	Tensile Load (N)		Min. Bend Radi. (mm)	Attenuation (dB/km)		Bandwidth (Mhz.km)		Link Dist. (m)
				Thick. (mm)	Dia. (mm)	1290~1330(nm)	1550(nm)				Installing	Operating			850/1310(nm)	1300/1550(nm)		850(nm)	1300(nm)	1300(nm)		
OF06-9/125-AICI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	9.2±0.4	125±1	242±7	3.0↓	18↓	215	2.0±0.3	600	500	133	0.4	0.3	N/A	N/A	N/A	
OF06-8/125-AICI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	8.6±0.4	125±1	242±7	3.0↓	17.5↓	215	2.0±0.3	600	500	133	0.4	0.3	N/A	N/A	N/A	
OF06-50/125-AICI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	50±2.5	125±1	245±7	N/A	N/A	215	2.0±0.3	600	500	133	3.5	1.5	400	800	550	
OF06-50/125-G-AICI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	50±2.5	125±1	245±7	N/A	N/A	215	2.0±0.3	600	500	133	3.5	1.5	400	800	2,000	
OF06-62.5/125-AICI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	215	2.0±0.3	600	500	133	3.5	1.5	160	500	550	
OF06-62.5/125-G-AICI-FA	6	900±50	2.0±0.2	1.1	1.3	13.3±0.8	62.5±2.5	125±1	245±7	N/A	N/A	215	2.0±0.3	600	500	133	3.5	1.5	160	500	1,000	

### Construction



\* Temperature range(°C)

1. Installing : -10 ~ +60
2. Operating : -40 ~ +70

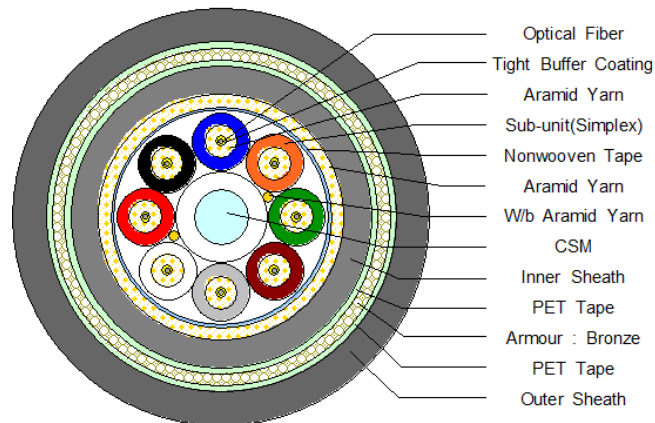
\* Flame-retardant (IEC 60332-1&3 CAT.A)

## Attachment 7

### CABLE TYPE : Flame retardant 8C : AIBI

Cable Code	Fiber Cont.	Buffer Dia. (μm)	Simplex Dia. (mm)	Inner		Outer Sheath		Core Dia. (μm)	Clad Dia. (μm)	Coat Dia. (μm)	Dispersion (ps/km-nm)		Approx. Cable Weight (kg/km)	CSM Dia. (mm)	Tensile Load (N)		Min. Bend Radi. (mm)	Attenuation (dB/km)		Bandwidth (Mhz.km)		Link Dist. (m)
				Thick. (mm)	Dia. (mm)	1290~1330(nm)	1550(nm)				Install ing	Opera ting			850/1310(nm)	1300/1550(nm)		850(nm)	1300(nm)	1300(nm)		
OF08-9/125-AIBI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	9.2±0.4	125±1	242±7	3.0↓	18↓	255	3.2±0.4	800	500	145	0.4	0.3	N/A	N/A	N/A	
OF08-8/125-AIBI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	8.6±0.4	125±1	242±7	3.0↓	17.5↓	255	3.2±0.4	800	500	145	0.4	0.3	N/A	N/A	N/A	
OF08-50/125-AIBI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	50±2.5	125±1	245±7	N/A	N/A	255	3.2±0.4	800	500	145	3.5	1.5	400	800	550	
OF08-50/125-G-AIBI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	50±2.5	125±1	245±7	N/A	N/A	255	3.2±0.4	800	500	145	3.5	1.5	400	800	2,000	
OF08-62.5/125-AIBI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	62.5±2.5	125±1	245±7	N/A	N/A	255	3.2±0.4	800	500	145	3.5	1.5	160	500	550	
OF08-62.5/125-G-AIBI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	62.5±2.5	125±1	245±7	N/A	N/A	255	3.2±0.4	800	500	145	3.5	1.5	160	500	1,000	

### Construction



\* Temperature range(°C)

1. Installing

: -10 ~ +60

2. Operating

: -40 ~ +70

\* Flame-retardant (IEC 60332-1&3 CAT.A)

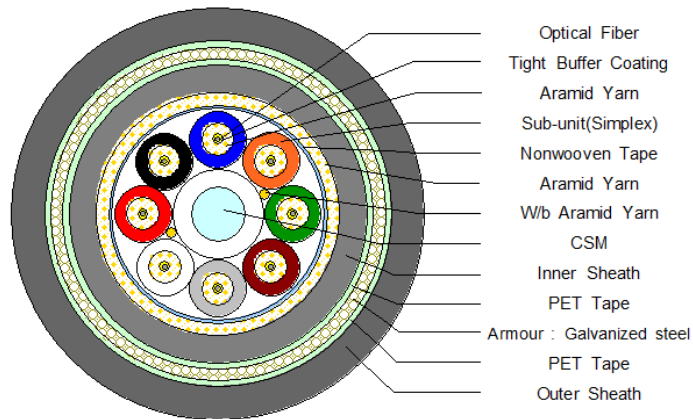


## Attachment 8

### CABLE TYPE : Flame retardant 8C : AICI

Cable Code	Fiber Cont.	Buffer Dia. (μm)	Simplex Dia. (mm)	Inner		Outer Sheath		Core Dia. (μm)	Clad Dia. (μm)	Coat Dia. (μm)	Dispersion (ps/km-nm)		Approx. Cable Weight (kg/km)	CSM Dia. (mm)	Tensile Load (N)		Min. Bend Radi. (mm)	Attenuation (dB/km)		Bandwidth (Mhz.km)		Link Dist. (m)
				Thick. (mm)	Dia. (mm)	1290~1330(nm)	1550(nm)				Install ing	Opera ting			850/1310(nm)	1300/1550(nm)		850(nm)	1300(nm)	1300(nm)		
OF08-9/125-AICI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	9.2±0.4	125±1	242±7	3.0↓	18↓	250	3.2±0.4	800	500	145	0.4	0.3	N/A	N/A	N/A	
OF08-8/125-AICI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	8.6±0.4	125±1	242±7	3.0↓	17.5↓	250	3.2±0.4	800	500	145	0.4	0.3	N/A	N/A	N/A	
OF08-50/125-AICI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	50±2.5	125±1	245±7	N/A	N/A	250	3.2±0.4	800	500	145	3.5	1.5	400	800	550	
OF08-50/125-G-AICI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	50±2.5	125±1	245±7	N/A	N/A	250	3.2±0.4	800	500	145	3.5	1.5	400	800	2,000	
OF08-62.5/125-AICI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	62.5±2.5	125±1	245±7	N/A	N/A	250	3.2±0.4	800	500	145	3.5	1.5	160	500	550	
OF08-62.5/125-G-AICI-FA	8	900±50	2.0±0.2	1.1	1.3	14.5±1.0	62.5±2.5	125±1	245±7	N/A	N/A	250	3.2±0.4	800	500	145	3.5	1.5	160	500	1,000	

### Construction



\* Temperature range(°C)

1. Installing

: -10 ~ +60

2. Operating

: -40 ~ +70

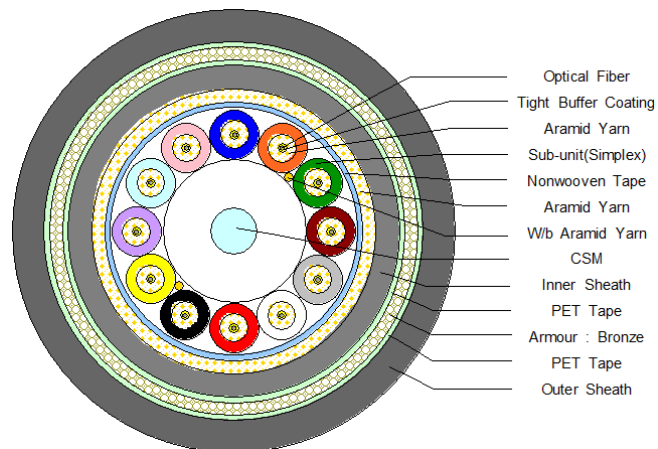
\* Flame-retardant (IEC 60332-1&3 CAT.A)

## Attachment 9

### CABLE TYPE : Flame retardant 12C : AIBI

Cable Code	Fiber Cont.	Buffer Dia. (μm)	Simplex Dia. (mm)	Inner		Outer Sheath		Core Dia. (μm)	Clad Dia. (μm)	Coat Dia. (μm)	Dispersion (ps/km-nm)		Approx. Cable Weight (kg/km)	CSM Dia. (mm)	Tensile Load (N)		Min. Bend Radi. (mm)	Attenuation (dB/km)		Bandwidth (Mhz.km)		Link Dist. (m)
				Thick. (mm)	Dia. (mm)	1290~1330(nm)	1550(nm)				Install ing	Opera ting			850/1310(nm)	1300/1550(nm)		850(nm)	1300(nm)	1300(nm)		
OF12-9/125-AIBI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	9.2±0.4	125±1	242±7	3.0↓	18↓	345	5.7±0.5	800	500	170	0.4	0.3	N/A	N/A	N/A	
OF12-8/125-AIBI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	8.6±0.4	125±1	242±7	3.0↓	17.5↓	345	5.7±0.5	800	500	170	0.4	0.3	N/A	N/A	N/A	
OF12-50/125-AIBI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	50±2.5	125±1	245±7	N/A	N/A	345	5.7±0.5	800	500	170	3.5	1.5	400	800	550	
OF12-50/125-G-AIBI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	50±2.5	125±1	245±7	N/A	N/A	345	5.7±0.5	800	500	170	3.5	1.5	400	800	2,000	
OF12-62.5/125-AIBI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	62.5±2.5	125±1	245±7	N/A	N/A	345	5.7±0.5	800	500	170	3.5	1.5	160	500	550	
OF12-62.5/125-G-AIBI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	62.5±2.5	125±1	245±7	N/A	N/A	345	5.7±0.5	800	500	170	3.5	1.5	160	500	1,000	

### Construction



\* Temperature range(°C)

1. Installing : -10 ~ +60

2. Operating : -40 ~ +70

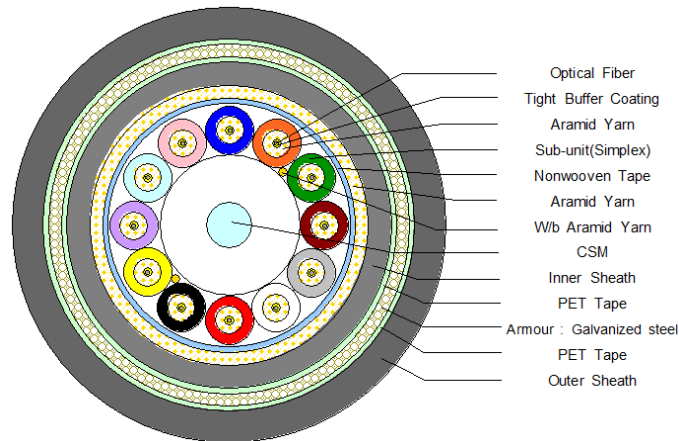
\* Flame-retardant (IEC 60332-1&3 CAT.A)

## Attachment 10

### CABLE TYPE : Flame retardant 12C : AICI

Cable Code	Fiber Cont.	Buffer Dia. (μm)	Simplex Dia. (mm)	Inner		Outer Sheath		Core Dia. (μm)	Clad Dia. (μm)	Coat Dia. (μm)	Dispersion (ps/km-nm)		Approx. Cable Weight (kg/km)	CSM Dia. (mm)	Tensile Load (N)		Min. Bend Radi. (mm)	Attenuation (dB/km)		Bandwidth (Mhz.km)		Link Dist. (m)
				Thick. (mm)	Dia. (mm)	1290~1330(nm)	1550(nm)				Installing	Operating			850/1310(nm)	1300/1550(nm)		850(nm)	1300(nm)	1300(nm)		
OF12-9/125-AICI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	9.2±0.4	125±1	242±7	3.0↓	18↓	335	5.7±0.5	800	500	170	0.4	0.3	N/A	N/A	N/A	
OF12-8/125-AICI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	8.6±0.4	125±1	242±7	3.0↓	17.5↓	335	5.7±0.5	800	500	170	0.4	0.3	N/A	N/A	N/A	
OF12-50/125-AICI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	50±2.5	125±1	245±7	N/A	N/A	335	5.7±0.5	800	500	170	3.5	1.5	400	800	550	
OF12-50/125-G-AICI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	50±2.5	125±1	245±7	N/A	N/A	335	5.7±0.5	800	500	170	3.5	1.5	400	800	2,000	
OF12-62.5/125-AICI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	62.5±2.5	125±1	245±7	N/A	N/A	335	5.7±0.5	800	500	170	3.5	1.5	160	500	550	
OF12-62.5/125-G-AICI-FA	12	900±50	2.0±0.2	1.1	1.3	17.0±1.0	62.5±2.5	125±1	245±7	N/A	N/A	335	5.7±0.5	800	500	170	3.5	1.5	160	500	1,000	

### Construction



\* Temperature range(°C)

1. Installing

: -10 ~ +60

2. Operating

: -40 ~ +70

\* Flame-retardant (IEC 60332-1&3 CAT.A)