

Content

- General 4
- 4F G.657 ADSS micro with minimum 50m span in medium load..... 5
 - Scope 5
 - Cable Description 5
 - Quality 5
 - Reliability 5
 - Reference 5
 - Life Time 5
 - Optical fibres 5
 - Optical Cable 6
 - Technical Characteristics 6
 - Dimensions and Descriptions 6
 - Mechanical and Environmental Performance..... 6
 - Environmental and installation condition 7
 - Mechanical, Physical and Environmental Test Characteristics 7
- 12F G.657 ADSS mini with minimum 50m span in medium load..... 8
 - Scope 8
 - Reference 8
 - Life Time 8
 - Application..... 8
 - Optical Fibre 8
 - Optical Cable 9
 - Technical Characteristics 9
 - Dimensions and Descriptions 9
 - Mechanical Performance 10
 - Environmental performance and installation condition 10
 - Mechanical, Physical and Environmental Test Characteristics 10
- 24F G.657 ADSS mini with minimum 50m span in medium load..... 11
 - Scope 11
 - Reference 11
 - Life Time 11
 - Application..... 11
 - Optical Fibre 12
 - Optical Cable 12

Technical Characteristics	12
Dimensions and Descriptions	12
Mechanical Performance	13
Environmental performance and installation condition	13
Mechanical, Physical and Environmental Test Characteristics	13
48F G.657 ADSS mini with minimum 50m span in medium load.....	14
Scope	14
Reference	14
Life Time	14
Application.....	14
Optical Fibre	15
Optical Cable	15
Technical Characteristics	15
Dimensions and Descriptions	15
Mechanical Performance	16
Environmental Performance and installation condition	16
Mechanical, Physical and Environmental Test Characteristics	16
48F G.657 ADSS with minimum 80m span in heavy load.....	17
Scope	17
Reference	17
Life Time	17
Application.....	18
Optical Fibre	18
Optical Cable	18
Technical Characteristics	18
Dimensions and Descriptions	18
Mechanical Performance	19
Environmental performance and installation condition	19
Mechanical, Physical and Environmental Test Characteristics	19
96F G.657 ADSS with minimum 80m span in heavy load.....	20
Scope	20
Reference	20
Life Time	21
Application.....	21
Optical Fibre	21
Optical Cable	21

Technical Characteristics	21
Dimensions and Descriptions	22
Mechanical Performance	22
Environmental performance and installation condition	22
Mechanical, Physical and Environmental Test Characteristics	22
12/24/48/72/96/144/216/288 G.657 mini to be blown in pipes of 12mm internal profile	24
Scope	24
Cable Description	24
Quality	24
Reliability	24
Reference	24
Working Condition.....	24
Minimum Allowable Bending Radius	24
Life Time	24
Optical Fibre	24
Optical Cable	25
General Design	25
Dimensions and Descriptions of Cable Construction	25
Mechanical, Physical and Environmental Test Characteristics	26
Environmental and installation condition	27
Color Code and Cable Sheath marking.....	28
Color Code of Fibres	28
Cable sheath marking.....	29

General

All cables must be designed to work at least under the following environmental conditions:

- Absolute maximum air temperature with a return period of 50 years (1951-2005): 40°C
- Absolute minimum air temperature with a return period of 50 years (1951-2005): -34°C
- Mean air temperature in January (1971-2000): between -8°C and +6°C
- Mean air temperature in July (1971-2000): between +6°C and +22°C
- Maximum snow cover depth with a return period of 50 years (1951-2005): 500 cm
- Maximum snow load with a return period of 50 years (1951-2005): 15KN/m²
- Maximum ice thickness: 5 - 12.5cm (depending on cable thickness)
- Mean annual wind power density at 10 m (1994-2001): max: 450W/m²
- Mean annual wind power density at 50 m (1994-2001): max: 850W/m²
- Mean annual wind speed at 10 m (1994-2001): max: 5 m/s
- Mean annual wind speed at 50 m (1994-2001): max: 5 m/s

4F G.657 ADSS micro with minimum 50m span in medium load

Scope

This Specification covers the design requirements and performance standard for the supply of optical fibre cable in the industry.

Cable type	Application
4F ADSS micro	Self-supporting aerial installation

Cable Description

- Optical fibres must be housed in outer jacket and used as optical communication medium
- Water blocking aramid yarns must be used in the cable core to prevent it from water ingress
- LSZH (Low smoke, Zero halogen,) outer sheath must be extruded around the cable, EU certificate for in-building installation must be provided.
- Does not need to have length signs every meter
- Maximum reel weight 50kg, optimum reel weight 25kg (can be packed in cardboxed reels).

Quality

The supplier must ensure a stable quality control system for the cable products through several programs including ISO 9001, ISO 14001 and OHS.

Reliability

Initial and periodic qualification tests for raw material and cable product must be performed to assure the cable's performance and durability in the field environment.

Reference

The cable offered must be designed, manufactured and tested according to the standards as follows:

ITU-T G.657	Characteristics of a single-mode optical fibre
IEC 60794-1-1	Optical fibre cables-part 1-1: Generic specification-General
IEC 60794-1-2	Optical fibre cables-part 1-2: Generic specification-Basic optical cable test procedure
IEC 60794-3	Optical fibre cables-part 3: Sectional specification-Outdoor cables
IEC 60794-3-20	Optical fibre cables-part 3-20: Outdoor cables-Family specification for optical self-supporting aerial communication cables

Life Time

Optical fibre cables offered in compliance with this specification must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics of the cable.

Optical fibres

Optical Fibres offered must meet the requirements of ITU-T G.657A1

Parameter	Specification
MFD (1310nm)	8.8±0.4µm
MFD (1550nm)	9.8±0.5µm

Cladding diameter	125±0.7µm
Fibre diameter	245±5µm, with UV coating, and coloured to: 250±15µm
Core/cladding concentricity error	≤ 0.5µm
Coating/cladding concentricity error	≤ 12.0µm
Cladding non-circularity	≤ 0.7%
Cut off wavelength	λ _{cc} ≤1260nm
Attenuation coefficient	1310nm: 0.36dB/km max after cabling 1550nm: 0.22dB/km max after cabling
Bending-loss performance of optical fibres @1550nm	≤0.25dB (10 turns around a mandrel of 30mm diameter)
Polarization mode dispersion maximum individual fibre	0.1ps/km
Polarization mode dispersion link value	≤0,06 ps/km
Zero-dispersion wavelength	1300~1324nm
Zero-dispersion slope	≤0.092ps/nm ² ·km

Optical Cable

Technical Characteristics

- High-integrated coloured bare fibre design
- Aramid yarn as strength member making cable have excellent tensile strength performance
- The outer jacket material has many advantages such as anti-corrosion, waterproof, anti-ultraviolet radiation, flame-retardant and harmless to environment etc.

Dimensions and Descriptions

Items	Contents	Descriptions
Optical Fibre	Counts	4
	Fibre Type	ITU-T G.657A1
Strength Member	Material	Water blocking aramid yarns
Outer Sheath	Material	HDPE, LSZH, UV resistant
	Colour Code	Black
	Thickness(mm)	0.75
Cable Diameter(mm) Approx.		≈3.2mm
Cable Weight(kg/km) Approx.		13

Mechanical and Environmental Performance

Span(M)	Tensile performance(N)		Crush(N/100mm)
	Short term	Long term	Short term
50	750	250	50

Environmental and installation condition

Max. wind speed	Max. ice thickness	Initial Installation sag	Temperature
27.07	0	1	-40~+70°C
Operation temperature		-25°C ~ +60°C	
Installation temperature		-10°C ~ +50°C	
Storage & transportation temperature		-30°C ~ + 60°C	

Mechanical, Physical and Environmental Test Characteristics

The mechanical and environmental performance of the cable must be in accordance with the following table. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550nm.

Item	Test Method	Requirements
Tension	<u>IEC 60794-1-2-E1</u> Load: According to 3.5 Sample length: Not less than 25m. Duration time: 1min.	Additional attenuation: ≤0.4B after test No damage to outer jacket
Crush	<u>IEC 60794-1-2-E3</u> Load: According to 3.5 Duration of load: 1min	Additional attenuation: ≤0.4B after test No damage to outer jacket
Impact	<u>IEC 60794-1-2-E4</u> Radius: 300mm Impact energy: 1 Impact number: 1 Impact points:3	Additional attenuation: ≤0.4B No damage to outer jacket
Bend	<u>IEC 60794-1-2-E11A</u> Mandrel radius:10*D Turns: 5 Cycles: 5	Additional attenuation: ≤0.4B No damage to outer jacket
Repeated bending	<u>IEC 60794-1-2-E6</u> Bending radius: 20*D Cycles: 30 Load: 20	Additional attenuation: ≤0.4B No damage to outer jacket
Torsion	<u>IEC 60794-1-2-E7</u> Cycles:10 Length under test: 1m Turns: ± 180° Load: 20	Additional attenuation: ≤0.4B No damage to outer jacket
Temperature cycling	<u>IEC 60794-1-2-F1</u> Sample length: at least 1000m Temperature range: -40→+70°C Cycles: 2 Temperature cycling test dwell time: 8hours	The change in attenuation coefficient shall be less than 0.1dB/km at 1550nm.
Water Penetration	<u>IEC 60794-1-2-F5B</u> Time: 24 hours Sample length: 3m Water height: 1m	No water leakage.

Other parametersAccording to IEC 60794 -1

12F G.657 ADSS mini with minimum 50m span in medium load

Scope

This Specification covers the design requirements and performance standard for the supply of optical fibre cable in the industry. A stable quality control system for the cable products through several programs including ISO 9001, ISO 14001 and OHS must be ensured.

Cable type	Application
ADSS 50m 12F	Self-supporting aerial installation

Reference

The cable offered must be designed, manufactured and tested according to the standards as follows:

ITU-T G.657A1	Characteristics of a single-mode optical fibre
IEC 60794-1-1	Optical fibre cables-part 1-1: Generic specification-General
IEC 60794-1-2	Optical fibre cables-part 1-2: Generic specification-Basic optical cable test procedure
IEC 60794-3	Optical fibre cables-part 3: Sectional specification-Outdoor cables
IEC 60794-4-20	Aerial optical cables along electrical power lines – Family specification for ADSS (All Dielectric Self Supported) optical cables

Life Time

Optical fibre cables offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics of the cable.

Application

Item	Value
Max. pole distance	50m
Operation temperature	-20 °C ~ +70 °C
Storage temperature	-20 °C ~ +70 °C
Static bending radius	10 times the cable diameter
Dynamic bending radius	20 times the cable diameter

Optical Fibre

Optical Fibres offered must meet the requirements of ITU-T G.657A1

Parameter	Specification
MFD (1310nm)	8.8±0.4µm
MFD (1550nm)	9.8±0.5µm
Cladding diameter	125±0.7µm
Fibre diameter	245±5µm, with UV coating, and coloured to: 250±15µm

Core/cladding concentricity error	$\leq 0.5\mu\text{m}$
Coating/cladding concentricity error	$\leq 12.0\mu\text{m}$
Cladding non-circularity	$\leq 0.7\%$
Cut off wavelength	$\lambda_{\text{cc}} \leq 1260\text{nm}$
Attenuation coefficient	1310nm: 0.36dB/km max after cabling 1550nm: 0.22dB/km max after cabling
Bending-loss performance of optical fibres @1550nm	$\leq 0.25\text{dB}$ (10 turns around a mandrel of 30mm diameter)
Polarization mode dispersion maximum individual fibre	$\leq 0.1\text{ps}/\sqrt{\text{km}}$
Polarization mode dispersion link value	$\leq 0,06\text{ps}/\sqrt{\text{km}}$
Zero-dispersion wavelength	1300~1324nm
Zero-dispersion slope	$\leq 0.092\text{ps}/\text{nm}^2 \cdot \text{km}$

Optical Cable

Technical Characteristics

- The second coating and stranding technology provide the fibres with enough space and bending endurance, which ensure good optical property of the fibres in the cable
- Accurate process control ensures good mechanical and temperature performance
- High quality raw material guarantees the long service life of cable

Dimensions and Descriptions

The standard optical cable structure is shown in the following table:

Item	Contents	Value
		12
Structure	Type	1+5
Loose tube or central tube	Fibre count/tube	12
	Outer diameter (mm)	2,4
Central strength member	Material	FRP
	Diameter (mm)	1,8
	PE layer diameter (mm)	-
Water blocking	Material	Water blocking yarn & tape
Peripheral strength member	Material	Aramid yarn
Sheath	Material	HDPE
	Colour	Black
	Thickness (mm)	Nominal: 1.5
Ripcord	Number	2

Cable diameter(mm) MAXIMUM Approx.	7
Cable weight(kg/km) MAXIMUM Approx.	75

Mechanical Performance

Main mechanical performance

Item	Max allowable tension(N)	Fibre strain (%)	Crush(N/100mm)	
			Short term	Long term
12	2500	≤0.6	1500	750
	1800	≤0.33	1500	750

Environmental performance and installation condition

Max. wind speed	Max. ice thickness	Initial Installation sag	Temperature
17.5m/s	6.5mm	1.5%	-40 °C~+70 °C

Mechanical, Physical and Environmental Test Characteristics

The mechanical and environmental performance of the cable must be in accordance with the following table. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550nm.

Items	Test Method	Requirements
Tension	<u>IEC 60794-1-2-E1</u> Load: According to 3.5 Sample length: Not less than 50m. Duration time: 1min.	Additional attenuation: ≤0.05dB after test No damage to outer jacket and inner elements
Crush	<u>IEC 60794-1-2-E3</u> Load: According to 3.5 Duration of load: 1min	Additional attenuation: ≤0.05dB after test No damage to outer jacket and inner elements
Impact	<u>IEC 60794-1-2-E4</u> Radius: 300 mm Impact energy: 10 J Impact number: 1 Impact points: 3	Additional attenuation: ≤0.1dB No damage to outer jacket and inner elements
Repeated bending	<u>IEC 60794-1-2-E6</u> Bending radius: 20*D Cycles: 25 Load: 150N	Additional attenuation: ≤0.05dB No damage to outer jacket and inner elements
Torsion	<u>IEC 60794-1-2-E7</u> Cycles:10 Length under test: 1m Turns: ± 180° Load: 150N	Additional attenuation: ≤0.1dB No damage to outer jacket and inner elements
Water Penetration	<u>IEC 60794-1-2-F5B</u> Time: 24 hours Sample length: 3m	No water leakage.

	Water height: 1m	
Temperature cycling	IEC 60794-1-2-F1 Sample length: at least 1000m Temperature range: -40 °C ~+70 °C Cycles: 2 Temperature cycling test dwell time: 12 hours	The change in attenuation coefficient shall be less than 0.05 dB/km.
Other parameters	According to IEC 60794-1	

24F G.657 ADSS mini with minimum 50m span in medium load

Scope

This Specification covers the design requirements and performance standard for the supply of optical fibre cable in the industry. A stable quality control system for the cable products through several programs including ISO 9001, ISO 14001 and OHS must be ensured.

Cable type	Application
ADSS 50m 24F	Self-supporting aerial installation

Reference

The cable offered must be designed, manufactured and tested according to the standards as follows:

ITU-T G.657A1	Characteristics of a single-mode optical fibre
IEC 60794-1-1	Optical fibre cables-part 1-1: Generic specification-General
IEC 60794-1-2	Optical fibre cables-part 1-2: Generic specification-Basic optical cable test procedure
IEC 60794-3	Optical fibre cables-part 3: Sectional specification-Outdoor cables
IEC 60794-4-20	Aerial optical cables along electrical power lines – Family specification for ADSS (All Dielectric Self Supported) optical cables

Life Time

Optical fibre cables offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics of the cable.

Application

Item	Value
Max. pole distance	50m
Operation temperature	-20 °C ~+70 °C
Storage temperature	-20 °C ~+70 °C
Static bending radius	10 times the cable diameter
Dynamic bending radius	20 times the cable diameter

Optical Fibre

Optical Fibres offered must meet the requirements of ITU-T G.657A1

Parameter	Specification
MFD (1310nm)	8.8±0.4µm
MFD (1550nm)	9.8±0.5µm
Cladding diameter	125±0.7µm
Fibre diameter	245±5µm, with UV coating, and coloured to: 250±15µm
Core/cladding concentricity error	≤ 0.5µm
Coating/cladding concentricity error	≤ 12.0µm
Cladding non-circularity	≤ 0.7%
Cut off wavelength	$\lambda_{cc} \leq 1260\text{nm}$
Attenuation coefficient	1310nm: 0.36dB/km max after cabling 1550nm: 0.22dB/km max after cabling
Bending-loss performance of optical fibres @1550nm	≤0.25dB (10 turns around a mandrel of 30mm diameter)
Polarization mode dispersion maximum individual fibre	≤0.1ps/√km
Polarization mode dispersion link value	≤ 0,06ps/√km
Zero-dispersion wavelength	1300~1324nm
Zero-dispersion slope	≤0.092ps/nm ² ·km

Optical Cable

Technical Characteristics

- The second coating and stranding technology provide the fibres with enough space and bending endurance, which ensure good optical property of the fibres in the cable
- Accurate process control ensures good mechanical and temperature performance
- High quality raw material guarantees the long service life of cable

Dimensions and Descriptions

The standard optical cable structure is shown in the following table:

Item	Contents	Value
		24
Structure	Type	1+5
Loose tube or central tube	Fibre count/tube	12
	Outer diameter (mm)	2,4
Central strength member	Material	FRP
	Diameter (mm)	1,8
	PE layer diameter (mm)	-

Water blocking	Material	Water blocking yarn & tape
Peripheral strength member	Material	Aramid yarn
Sheath	Material	HDPE
	Colour	Black
	Thickness (mm)	Nominal: 1.5
Ripcord	Number	2
Cable diameter(mm) MAXIMUM Approx.		7
Cable weight(kg/km) MAXIMUM Approx.		75

Mechanical Performance

Main mechanical performance

Item	Max allowable tension(N)	Fibre strain (%)	Crush(N/100mm)	
			Short term	Long term
12	2500	≤0.6	1500	750
	1800	≤0.33	1500	750

Environmental performance and installation condition

Max. wind speed	Max. ice thickness	Initial Installation sag	Temperature
17.5m/s	6.5mm	1.5%	-40 °C~+70 °C

Mechanical, Physical and Environmental Test Characteristics

The mechanical and environmental performance of the cable must be in accordance with the following table. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550nm.

Items	Test Method	Requirements
Tension	IEC 60794-1-2-E1 Load: According to 3.5 Sample length: Not less than 50m. Duration time: 1min.	Additional attenuation: ≤0.05dB after test No damage to outer jacket and inner elements
Crush	IEC 60794-1-2-E3 Load: According to 3.5 Duration of load: 1min	Additional attenuation: ≤0.05dB after test No damage to outer jacket and inner elements
Impact	IEC 60794-1-2-E4 Radius: 300 mm Impact energy: 10 J Impact number: 1 Impact points: 3	Additional attenuation: ≤0.1dB No damage to outer jacket and inner elements

Repeated bending	IEC 60794-1-2-E6 Bending radius: 20*D Cycles: 25 Load: 150N	Additional attenuation: ≤0.05dB No damage to outer jacket and inner elements
Torsion	IEC 60794-1-2-E7 Cycles:10 Length under test: 1m Turns: ± 180° Load: 150N	Additional attenuation: ≤0.1dB No damage to outer jacket and inner elements
Water Penetration	IEC 60794-1-2-F5B Time: 24 hours Sample length: 3m Water height: 1m	No water leakage.
Temperature cycling	IEC 60794-1-2-F1 Sample length: at least 1000m Temperature range: -40 °C ~+70 °C Cycles: 2 Temperature cycling test dwell time: 12 hours	The change in attenuation coefficient shall be less than 0.05 dB/km.
Other parameters	According to IEC 60794-1	

48F G.657 ADSS mini with minimum 50m span in medium load

Scope

This Specification covers the design requirements and performance standard for the supply of optical fibre cable in the industry. A stable quality control system for the cable products through several programs including ISO 9001, ISO 14001 and OHS must be ensured.

Cable type	Application
ADSS-SS-50m-48	Self-supporting aerial installation

Reference

The cable offered must be designed, manufactured and tested according to the standards as follows:

ITU-T G.657A1	Characteristics of a single-mode optical fibre
IEC 60794-1-1	Optical fibre cables-part 1-1: Generic specification-General
IEC 60794-1-2	Optical fibre cables-part 1-2: Generic specification-Basic optical cable test procedure
IEC 60794-3	Optical fibre cables-part 3: Sectional specification-Outdoor cables
IEC 60794-4-20	Aerial optical cables along electrical power lines – Family specification for ADSS (All Dielectric Self Supported) optical cables

Life Time

Optical fibre cables offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics of the cable.

Application

Item	Value
------	-------

Max. pole distance	50m
Operation temperature	-40 °C ~ +70 °C
Storage temperature	-40 °C ~ +70 °C
Static bending radius	10 times the cable diameter
Dynamic bending radius	20 times the cable diameter

Optical Fibre

Optical Fibres offered must meet the requirements of ITU-T G.657A1

Parameter	Specification
MFD (1310nm)	8.8±0.4µm
MFD (1550nm)	9.8±0.5µm
Cladding diameter	125±0.7µm
Fibre diameter	245±5µm, with UV coating, and coloured to: 250±15µm
Core/cladding concentricity error	≤ 0.5µm
Coating/cladding concentricity error	≤ 12.0µm
Cladding non-circularity	≤ 0.7%
Cut off wavelength	$\lambda_{cc} \leq 1260\text{nm}$
Attenuation coefficient	1310nm: 0.36dB/km max after cabling 1550nm: 0.22dB/km max after cabling
Bending-loss performance of optical fibres @1550nm	≤0.25dB (10 turns around a mandrel of 30mm diameter)
Polarization mode dispersion maximum individual fibre	≤0.1ps/√km
Polarization mode dispersion link value	≤0,06ps/√km
Zero-dispersion wavelength	1300~1324nm
Zero-dispersion slope	≤0.092ps/nm ² ·km

Optical Cable

Technical Characteristics

- The second coating and stranding technology provide the fibres with enough space and bending endurance, which ensure good optical property of the fibres in the cable
- Accurate process control must ensure good mechanical and temperature performance
- High quality raw material must guarantee the long service life of cable

Dimensions and Descriptions

The standard optical cable structure is shown in the following table:

Item	Contents	Value
		48
Structure	Type	1+5
Loose tube	Fiber count/tube	12

	Outer diameter (mm)	2,4
Central strength member	Material	FRP
	Diameter (mm)	1,8
	PE layer diameter (mm)	-
Water blocking	Material	Water blocking yarn & tape
Peripheral strength member	Material	Aramid yarn
Sheath	Material	HDPE
	Color	Black
	Thickness (mm)	Nominal: 1.5
Ripcord	Number	2
Cable diameter(mm) MAXIMUM Approx.		10
Cable weight(kg/km) MAXIMUM Approx.		100

Mechanical Performance

Main mechanical performance

Item	Max allowable tension(N)	Fibre strain (%)	Crush(N/100mm)	
			Short term	Long term
48	2500	≤0.6	1500	750
	1800	≤0.33	1500	750

Environmental Performance and installation condition

Max. wind speed	Max. ice thickness	Initial Installation sag	Temperature
17.5m/s	6.5mm	1.5%	-40 °C ~ +70 °C

Mechanical, Physical and Environmental Test Characteristics

The mechanical and environmental performance of the cable must be in accordance with the following table. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550nm.

Items	Test Method	Requirements
Tension	IEC 60794-1-2-E1 Load: According to 3.5 Sample length: Not less than 50m. Duration time: 1min.	Additional attenuation: ≤0.05dB after test No damage to outer jacket and inner elements
Crush	IEC 60794-1-2-E3 Load: According to 3.5 Duration of load: 1min	Additional attenuation: ≤0.05dB after test No damage to outer jacket and inner elements
Impact	IEC 60794-1-2-E4 Radius: 300 mm Impact energy: 10 J Impact number: 1	Additional attenuation: ≤0.1dB No damage to outer jacket and inner elements

	Impact points: 3	
Repeated bending	IEC 60794-1-2-E6 Bending radius: 20*D Cycles: 25 Load: 150N	Additional attenuation: ≤0.05dB No damage to outer jacket and inner elements
Torsion	IEC 60794-1-2-E7 Cycles:10 Length under test: 1m Turns: ± 180° Load: 150N	Additional attenuation: ≤0.1dB No damage to outer jacket and inner elements
Water Penetration	IEC 60794-1-2-F5B Time: 24 hours Sample length: 3m Water height: 1m	No water leakage.
Temperature cycling	IEC 60794-1-2-F1 Sample length: at least 1000m Temperature range: -40 °C ~+70 °C Cycles: 2 Temperature cycling test dwell time: 12 hours	The change in attenuation coefficient shall be less than 0.05 dB/km.
Other parameters	According to IEC 60794-1	

48F G.657 ADSS with minimum 80m span in heavy load

Scope

This Specification covers the design requirements and performance standard for the supply of optical fibre cable in the industry. A stable quality control system for the cable products through several programs including ISO 9001, ISO 14001 and OHS must be ensured.

Cable type	Application
ADSS-SS-80m-48	Self-supporting aerial installation

80m represent the span.

Reference

The cable offered must be designed, manufactured and tested according to the standards as follows:

ITU-T G.657A1	Characteristics of a single-mode optical fibre
IEC 60794-1-1	Optical fibre cables-part 1-1: Generic specification-General
IEC 60794-1-2	Optical fibre cables-part 1-2: Generic specification-Basic optical cable test procedure
IEC 60794-3	Optical fibre cables-part 3: Sectional specification-Outdoor cables
IEC 60794-4-20	Aerial optical cables along electrical power lines – Family specification for ADSS (All Dielectric Self Supported) optical cables

Life Time

Optical fibre cables offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics of the cable.

Application

Item	Value
Max. pole distance	80m
Operation temperature	-40 °C~+70 °C
Storage temperature	-40 °C~+70 °C
Static bending radius	10 times the cable diameter
Dynamic bending radius	20 times the cable diameter

Optical Fibre

Optical Fibres offered must meet the requirements of ITU-T G.657A1

Parameter	Specification
MFD (1310nm)	8.8±0.4µm
MFD (1550nm)	9.8±0.5µm
Cladding diameter	125±0.7µm
Fibre diameter	245±5µm, with UV coating, and coloured to: 250±15µm
Core/cladding concentricity error	≤ 0.5µm
Coating/cladding concentricity error	≤ 12.0µm
Cladding non-circularity	≤ 0.7%
Cut off wavelength	$\lambda_{cc} \leq 1260\text{nm}$
Attenuation coefficient	1310nm: 0.36dB/km max after cabling 1550nm: 0.22dB/km max after cabling
Bending-loss performance of optical fibres @1550nm	≤0.25dB (10 turns around a mandrel of 30mm diameter)
Polarization mode dispersion maximum individual fibre	≤0.1ps/√km
Polarization mode dispersion link value	≤0,06ps/√km
Zero-dispersion wavelength	1300~1324nm
Zero-dispersion slope	≤0.092ps/nm ² ·km

Optical Cable

Technical Characteristics

- The second coating and stranding technology provide the fibres with enough space and bending endurance, which ensure good optical property of the fibres in the cable
- Accurate process control ensures good mechanical and temperature performance
- High quality raw material guarantees the long service life of cable

Dimensions and Descriptions

The standard optical cable structure is shown in the following table:

Item	Contents	Value
		48
Structure	Type	1+5
Loose tube	Fibre count/tube	12
	Outer diameter (mm)	2,4
Central strength member	Material	FRP
	Diameter (mm)	1,8
	PE layer diameter (mm)	-
Water blocking	Material	Water blocking yarn & tape
Peripheral strength member	Material	Aramid yarn
Sheath	Material	HDPE
	Colour	Black
	Thickness (mm)	Nominal: 1.5
Ripcord	Number	2
Cable diameter(mm) Approx.		up to 12
Cable weight(kg/km) Approx.		up to 120

Mechanical Performance

Main mechanical performance

Item	Max allowable tension(N)	Fibre strain (%)	Crush(N/100mm)	
			Short term	Long term
48	4000	≤0.33	1500	750
	5500	≤0.6	1500	750

Environmental performance and installation condition

Max. wind speed	Max. ice thickness	Initial Installation sag	Temperature
17.7m/s	12.5	1.5%	-40 °C~+70 °C

Mechanical, Physical and Environmental Test Characteristics

The mechanical and environmental performance of the cable must be in accordance with the following table. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550nm.

Items	Test Method	Requirements
Tension	IEC 60794-1-2-E1 Load: According to 3.5 Sample length: Not less than 50m. Duration time: 1min.	Additional attenuation: ≤0.05dB after test No damage to outer jacket and inner elements
Crush	IEC 60794-1-2-E3 Load: According to 3.5	Additional attenuation: ≤0.05dB after test No damage to outer jacket and inner elements

	Duration of load: 1min	
Impact	IEC 60794-1-2-E4 Radius: 300 mm Impact energy: 10 J Impact number: 1 Impact points: 3	Additional attenuation: ≤0.1dB No damage to outer jacket and inner elements
Repeated bending	IEC 60794-1-2-E6 Bending radius: 20*D Cycles: 25 Load: 150N	Additional attenuation: ≤0.05dB No damage to outer jacket and inner elements
Torsion	IEC 60794-1-2-E7 Cycles:10 Length under test: 1m Turns: ± 180° Load: 150N	Additional attenuation: ≤0.1dB No damage to outer jacket and inner elements
Water Penetration	IEC 60794-1-2-F5B Time: 24 hours Sample length: 3m Water height: 1m	No water leakage.
Temperature cycling	IEC 60794-1-2-F1 Sample length: at least 1000m Temperature range: -40 °C ~+70 °C Cycles: 2 Temperature cycling test dwell time: 12 hours	The change in attenuation coefficient shall be less than 0.05 dB/km.
Other parameters	According to IEC 60794-1	

96F G.657 ADSS with minimum 80m span in heavy load

Scope

This Specification covers the design requirements and performance standard for the supply of optical fibre cable in the industry. A stable quality control system for the cable products through several programs including ISO 9001, ISO 14001 and OHS must be ensured.

Cable type	Application
ADSS-SS-80m-96	Self-supporting aerial installation

80m represent the span.

Reference

The cable offered must be designed, manufactured and tested according to the standards as follows:

ITU-T G.657A1	Characteristics of a single-mode optical fibre
IEC 60794-1-1	Optical fibre cables-part 1-1: Generic specification-General
IEC 60794-1-2	Optical fibre cables-part 1-2: Generic specification-Basic optical cable test procedure
IEC 60794-3	Optical fibre cables-part 3: Sectional specification-Outdoor cables
IEC 60794-4-20	Aerial optical cables along electrical power lines – Family specification for ADSS (All Dielectric Self Supported) optical cables

Life Time

Optical fibre cables offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics of the cable.

Application

Item	Value
Max. pole distance	80m
Operation temperature	-40 °C ~ +70 °C
Storage temperature	-40 °C ~ +70 °C
Static bending radius	10 times the cable diameter
Dynamic bending radius	20 times the cable diameter

Optical Fibre

Optical Fibres offered must meet the requirements of ITU-T G.657A1

Parameter	Specification
MFD (1310nm)	8.8±0.4µm
MFD (1550nm)	9.8±0.5µm
Cladding diameter	125±0.7µm
Fibre diameter	245±5µm, with UV coating, and coloured to: 250±15µm
Core/cladding concentricity error	≤ 0.5µm
Coating/cladding concentricity error	≤ 12.0µm
Cladding non-circularity	≤ 0.7%
Cut off wavelength	$\lambda_{cc} \leq 1260\text{nm}$
Attenuation coefficient	1310nm: 0.36dB/km max after cabling 1550nm: 0.22dB/km max after cabling
Bending-loss performance of optical fibres @1550nm	≤0.25dB (10 turns around a mandrel of 30mm diameter)
Polarization mode dispersion maximum individual fibre	≤0.1ps/√km
Polarization mode dispersion link value	≤0.06ps/√km
Zero-dispersion wavelength	1300~1324nm
Zero-dispersion slope	≤0.092ps/nm ² ·km

Optical Cable

Technical Characteristics

- The second coating and stranding technology provide the fibres with enough space and bending endurance, which ensure good optical property of the fibres in the cable
- Accurate process control ensures good mechanical and temperature performance

- High quality raw material guarantees the long service life of cable

Dimensions and Descriptions

The standard optical cable structure is shown in the following table:

Item	Contents	Value
		96
Structure	Type	1+5
Loose tube	Fibre count/tube	12
	Outer diameter (mm)	2,4
Central strength member	Material	FRP
	Diameter (mm)	1,8
	PE layer diameter (mm)	-
Water blocking	Material	Water blocking yarn & tape
Peripheral strength member	Material	Aramid yarn
Sheath	Material	HDPE
	Colour	Black
	Thickness (mm)	Nominal: 1.5
Ripcord	Number	2
Cable diameter(mm) MAXIMUM Approx.		up to 14
Cable weight(kg/km) MAXIMUM Approx.		up to 140

Mechanical Performance

Main mechanical performance

Item	Max allowable tension(N)	Fibre strain (%)	Crush(N/100mm)	
			Short term	Long term
48	4000	≤0.33	1500	750
	5500	≤0.6	1500	750

Environmental performance and installation condition

Max. wind speed	Max. ice thickness	Initial Installation sag	Temperature
17.7m/s	12.5	1.5%	-40 °C ~ +70 °C

Mechanical, Physical and Environmental Test Characteristics

The mechanical and environmental performance of the cable must be in accordance with the following table. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550nm.

Items	Test Method	Requirements
Tension	<u>IEC 60794-1-2-E1</u> Load: According to 3.5 Sample length: Not less than 50m. Duration time: 1min.	Additional attenuation: ≤ 0.05 dB after test No damage to outer jacket and inner elements
Crush	<u>IEC 60794-1-2-E3</u> Load: According to 3.5 Duration of load: 1min	Additional attenuation: ≤ 0.05 dB after test No damage to outer jacket and inner elements
Impact	<u>IEC 60794-1-2-E4</u> Radius: 300 mm Impact energy: 10 J Impact number: 1 Impact points: 3	Additional attenuation: ≤ 0.1 dB No damage to outer jacket and inner elements
Repeated bending	<u>IEC 60794-1-2-E6</u> Bending radius: 20*D Cycles: 25 Load: 150N	Additional attenuation: ≤ 0.05 dB No damage to outer jacket and inner elements
Torsion	<u>IEC 60794-1-2-E7</u> Cycles:10 Length under test: 1m Turns: $\pm 180^\circ$ Load: 150N	Additional attenuation: ≤ 0.1 dB No damage to outer jacket and inner elements
Water Penetration	<u>IEC 60794-1-2-F5B</u> Time: 24 hours Sample length: 3m Water height: 1m	No water leakage.
Temperature cycling	<u>IEC 60794-1-2-F1</u> Sample length: at least 1000m Temperature range: $-40\text{ }^\circ\text{C} \sim +70\text{ }^\circ\text{C}$ Cycles: 2 Temperature cycling test dwell time: 12 hours	The change in attenuation coefficient shall be less than 0.05 dB/km.
Other parameters	According to <u>IEC 60794-1</u>	

12/24/48/72/96/144/216/288 G.657 mini to be blown in pipes of 12mm internal profile

Scope

This specification covers the design and performance of the single mode optical cables to be used in air blown micro duct application.

Cable Description

- 12/24/48/72/96/144/216/288 G.657A1 SM-fibres.
- Loose tubes SZ-stranded.
- Suitable for air blown installation in micro-duct.

Quality

A stable quality control system for the cable products through several programs including ISO 9001, ISO 14001 and OHS must be ensured.

Reliability

The supplier must ensure product reliability through rigorous qualification testing of each product family. Both initial and periodic qualification testing must be performed to assure the cable's performance and durability in the field environment.

Reference

ITU-T G.657A1	Characteristics of a single-mode optical fibre
IEC 60794-1-1	Optical fibre cables- part1-1-Generic specification-General
IEC 60794-1-2	Optical fibre cables- part1-2-Generic specification-Basic optical cable test procedure
IEC 60794-3	Optical fibre cables- part3-Sectional specification- Outdoor cables
IEC 60794-5	Optical fibre cables- part5-Sectional specification- Microduct cabling for installation by blowing

Working Condition

- Transportation and storage temperature: $-30^{\circ}\text{C}\sim+70^{\circ}\text{C}$
- Installation temperature: $-10^{\circ}\text{C}\sim+50^{\circ}\text{C}$
- Operation temperature: $-30^{\circ}\text{C}\sim+70^{\circ}\text{C}$

Minimum Allowable Bending Radius

- Static: 10D
- Dynamic: 20D

D is the out diameter of the cable

Life Time

Optical fibre cables offered in compliance with the specifications must withstand the typical service condition for a period of twenty-five (25) years without detriment to the transmission or operation and maintenance characteristics of the cable.

Optical Fibre

Optical Fibres offered must meet the requirements of ITU-T G.657A1

Parameter	Specification
MFD (1310nm)	$8.8\pm 0.4\mu\text{m}$

MFD (1550nm)	9.8±0.5µm
Cladding diameter	125±0.7µm
Fibre diameter	245±5µm, with UV coating, and coloured to: 250±15µm 200µm option for 144 to 288 fibre cable
Core/cladding concentricity error	≤ 0.5µm
Coating/cladding concentricity error	≤ 12.0µm
Cladding non-circularity	≤ 0.7%
Cut off wavelength	$\lambda_{cc} \leq 1260\text{nm}$
Attenuation coefficient	1310nm: 0.36dB/km max after cabling 1550nm: 0.22dB/km max after cabling
Bending-loss performance of optical fibres @1550nm	≤0.25dB (10 turns around a mandrel of 30mm diameter)
Polarization mode dispersion maximum individual fibre	≤0.1ps/√km
Polarization mode dispersion link value	≤ 0,06ps/√km
Zero-dispersion wavelength	1300~1324nm
Zero-dispersion slope	≤0.092ps/nm ² ·km

Optical Cable

General Design

- Optical fibres must be housed in loose tubes that are made of high-modulus plastic and filled with waterproof compounds.
- FRP must be applied as central strength member.
- Loose tubes must be SZ-stranded around the strength member.
- Water blocking yarns must be used in and over the cable core to prevent it from water ingress.
- Polyethylene sheath must be applied over the cable core as the outer sheath.

Dimensions and Descriptions of Cable Construction

Item	Contents	Value											
		12	24	48	72	96	144	216	288				
Loose tube	Number	1	2	4	6	8	12	6	18	9	24	12	
	Outer diameter ±0.1mm	1.45											
Filler	Number	5	4	2	0	0	0	0	0	0	0	0	
Fibre counts per tube	G.657A1	12						12	24	12	24	12	24
Central strength member	Material	FRP											
	Diameter (mm)	1.6				2.4	2.4	1.6		2,8			
	Diameter of PE lay	/				/	4.1	/		/			
Outer sheath	Material	HDPE											
	Colour	Black											
	Thickness	Approx.0.5											

	(mm)					
Cable diameter(± 0.2 mm)	5.4	6.1	7	8,5	9	
For micro –duct inside (mm)	8~12	8~12	10~12	12	12	
Max. Tensile strength (N)	600	800		600	1000	
Crush(N/100mm)	Short term: 500 Long term: 200					
Cable weight(kg/km) Approx.	26	36	52	80		

The supplier can offer thicker 216 and/or 288 fibre cable, but must submit exact installation rules, which allow the air blowing of the cable in a PEHD pipe of 12mm internal diameter to a distance greater than 1km! Same rule goes for the 144 fibre cable, in relation to a 10mm internal diameter PEHD pipe.

Mechanical, Physical and Environmental Test Characteristics

The finished cables must be subjected to the following mechanical conditions.

Item	Test Method	Requirements
Tensile performance	IEC 60794-1-2-E1 Load: according to short term tensile described in 3.2.2 Cable length under tension: Not less than 50m. Duration of load sustain: 1min. Velocity of transfer device: 10mm/min	The maximum fibre strain less than 0.6% under maximum tensile short-term load. The maximum increase in attenuation less than 0.1dB. No change in attenuation after test at 1550nm. Under visual examination without magnification, no damage to the sheath or to the cable elements after test.
Crush	IEC 60794-1-2-E3 Load: 500N Duration of load: 1min	No change in attenuation after test at 1550nm. Under visual examination without magnification, no damage to the sheath or to the cable elements. The imprint of the striking surface on the sheath is not considered mechanical damage.
Bend	IEC 60794-1-2-E11A Mandrel radius: 10 times cable diameter Turns:10 Cycles:5	No change in attenuation at 1550nm after test. Under visual examination without magnification, no damage to the sheath or to the cable elements.
Repeated bending	IEC 60794-1-2-E6 Bending radius: 20 times cable diameter Cycles: 25 Load: 25N Duration of cycle: Approximately 2s.	No change in attenuation at 1550nm after test. Under visual examination without magnification, no damage to the sheath or to the cable elements.
Torsion	IEC 60794-1-2-E7 Cycles: 5 Length under test: 1m Turns: $\pm 180^\circ$ Load: 40N	The variation on attenuation for each fibre less than 0.05dB at 1550nm Under visual examination without magnification, no damage to the sheath or to the cable elements. No permanent change in attenuation after test.

Temperature cycling	IEC 60794-1-2-F1 Sample length: at least 1000m Temperature range: -30°C~+70°C Cycles: 2 Temperature cycling test dwell time: 12 hours	There is no change in attenuation coefficient at 1550nm after the test.
Water Penetration	IEC 60794-1-2-F5B Time: 24 hours Sample length: 3m Water height: 1m	No water leakage
Compound flow	IEC 60794-1-2-E14 Sample count: 5 Sample length: 300 ±5 mm, Remove length: 130 ±2,5 mm, Time: 24h	No filling compound dripped.
Other parameters	According to IEC 60794, YD/T 1460.4-2006	

Remark: "No attenuation changes" is considered as the attenuation changes ≤ 0.05 dB.

Environmental and installation condition

- Transportation and storage temperature: -30°C~+70°C
- Installation temperature: -10°C~+50°C
- Operation temperature: -30°C~+70°C

Color Code and Cable Sheath marking

Color Code of Fibres

Standards: DIN VDE 0888 & IEC 60304

Fiber in tubes

<i>fiber ord. no</i>	<i>color</i>	<i>CAD color</i>	<i>fiber ord. no</i>	<i>color</i>	<i>CAD color</i>
1	red	red	13	red -	red -
2	green	green	14	green -	green -
3	blue	blue	15	blue -	blue -
4	yellow	yellow	16	yellow -	yellow -
5	white	9	17	white -	9 -
6	grey	8	18	grey -	8 -
7	brown	42	19	brown -	42 -
8	violet	magenta	20	violet -	magenta -
9	agua	cyan	21	agua -	cyan -
10	black	white/black	22	dark green	72
11	orange	40	23	orange -	40 -
12	pink	11	24	pink -	11 -

Tubes in cable

<i>tube ord. no</i>	<i>color</i>	<i>CAD color</i>
1	red	red
2	green	green
3	blue	blue
4	yellow	yellow
5	white	9
6	grey	8
7	brown	42
8	violet	magenta
9	agua	cyan
10	black	white/black
11	orange	40
12	pink	11

Cable sheath marking

Color of printing: white

- Contents: RUNE, year of manufacturing, DIN cable name, Fibre count x SM 9/125 <fibre type> cable number // meter marking
- Interval: $1 \pm 0.2\%$ m
- Outer sheath marking legend can be changed according to user's requests.
- 4F ADSS does not need consecutive meter markings.