
Sumitomo Cable Specification

SE-*N*

DriCore[®] Loose Tube Cables

Dry Waterblocked Stranded Tube Cables with 2 - 288 Optical Fibers

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1. General

This specification covers the design requirements and performance standards for the supply of optical fiber cables as described below. The features described in this document are intended to provide information on the performance of Sumitomo Electric Lightwave's optical cable and aid in handling and installation. Please refer to the separate fiber specification for details regarding the optical fiber.

1.1 Cable Description

Sumitomo's DriCore[®] Loose Tube optical cables contain 2 to 288 optical fibers. The color coded fibers are housed in multiple color coded plastic buffer tubes which are stranded around a dielectric central strength member. Dry water blocking tapes and yarns, wrapped around the core, provide protection against water ingress. These user friendly elements replace the sticky cable filling gel used in traditional loose tube cable designs. Aramid yarns, which provide additional tensile strength, are applied over the water blocking tape. The cable sheath is composed of a smooth medium density polyethylene (MDPE) jacket. An optional corrugated steel armor layer can be applied for rodent protection. Highly visible and robust ripcords are placed along the cable core for quick sheath entry.

For cables with fiber counts up to 288 fibers, a buffer tube of 2.5mm in diameter is utilized as a standard. Our reduced diameter buffer tubes allows for improved closure routing and flexibility while providing maximum protection to the fibers.

The DriCore[®] Loose Tube cable represents an advancement in loose tube cable technology through improving cable handling and reducing cable preparation time. Sumitomo's Loose Tube cables meet both RUS (formally REA) and Telcordia requirements.

1.2 Quality

Sumitomo ensures a high level of quality through ISO / TL 9000 registered Quality Management Systems and our commitment to continuous improvement. Guaranteed, high quality products have been manufactured at Sumitomo's facility in Research Triangle Park, North Carolina since 1984.

1.3 Reliability

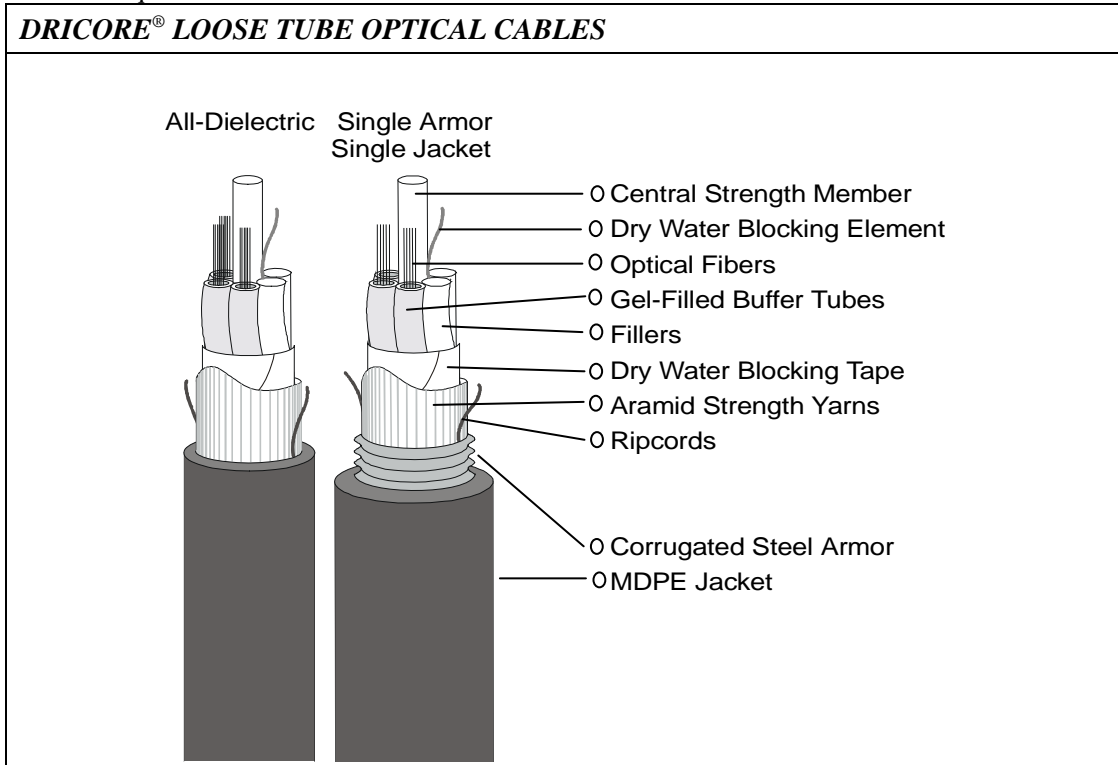
Sumitomo ensures product reliability through rigorous qualification testing of each product family to meet or exceed industry standards. Both initial and periodic qualification testing are performed to assure the cable's performance and durability in the field environment.

Sumitomo supports industry standards organizations such as Telcordia (formerly Bellcore), Telecommunications Industry Association (TIA), Insulated Cable Engineers Association (ICEA), International Telecommunications Union (ITU), International Electrotechnical Commission (IEC), American Society for Testing and Materials (ASTM), Rural Utilities Service (RUS), and The Institute of Electrical and Electronics Engineers (IEEE).

2. Cable Design

2.1 General

Sumitomo's DriCore® Loose Tube cables utilize Reverse Oscillating Lay (ROL) of the buffer tubes within a dry water blocked core making these cables best known for quick and clean cable entry in either end or midspan access. This cable style comes in three different sheath constructions designed for various outside plant applications and installation techniques.



2.1.1 All-Dielectric

The All-dielectric Loose Tube cable has a single MDPE outer jacket. The non-metallic design makes this cable ideal for lashed aerial applications. This cable's lightweight construction also makes this cable a favorite for conduit installations.

2.1.2 Single Jacket - Armored

The Single Jacket - Armored Sheath Loose Tube cable is composed of a corrugated steel armor layer with a single outer MDPE jacket. This express entry cable construction provides the necessary rodent protection and added compressive strength required for direct buried applications.

APPLICABLE SHEATH TYPES	
SHEATH TYPE	SUMITOMO PART #
All-Dielectric	SE-*NK
Single Jacket - Armored	SE-*NE

2.2 Fiber Types

The following fiber types are available in this cable design. Please refer to the appropriate fiber specification document for details on fiber design and performance.

<i>APPLICABLE FIBER TYPES</i>		
FIBER TYPE	ITU/TIA CLASS	SUMITOMO SPEC. #
PureBand™ – Zero Water Peak	ITU G.652D TIA Type Iva	SE-5**
PureMetro™ NZDSF	ITU G.655D TIA Type Ivd	SE-7**
PureAccess™ Bend Insensitive	ITU G.657A TIA Type Iva	SE-9**

2.3 Optical Fiber Color Code

The UV acrylate coated fibers are color coded with highly distinguishable, vibrant colors according to the following table. All colors meet Munsell standards as specified in TIA-359 and TIA-598.

<i>FIBER COLOR CODE</i>	
FIBER #	COLOR
1	Blue
2	Orange
3	Green
4	Brown
5	Slate
6	White
7	Red
8	Black
9	Yellow
10	Violet
11	Rose
12	Aqua

<i>BUFFER TUBE COLORS</i>	
TUBE #	COLOR
1	Blue
2	Orange
3	Green
4	Brown
5	Slate
6	White
7	Red
8	Black
9	Yellow
10	Violet
11	Rose
12	Aqua
13	Blue - Black Tracer
14	Orange - Black Tracer
15	Green - Black Tracer
16	Brown - Black Tracer
17	Slate - Black Tracer
18	White - Black Tracer
19	Red - Black Tracer
20	Black - White Tracer
21	Yellow - Black Tracer
22	Violet - Black Tracer
23	Rose - Black Tracer
24	Aqua - Black Tracer

2.4 Buffer Tubes

Fibers are housed in groups of 6 or 12 within gel-filled buffer tubes. The tubes, manufactured with industry standard polybutylene terephthalate (PBT). They are colored for easy identification according to the scheme shown above. Water blocking gel fills each tube to prevent migration of water through the tube. Industry standard tools and practices can be used to enter the buffer tubes.

The buffer tubes are stranded around the Central Strength Member utilizing Reverse Oscillating Lay (ROL). ROL stranding wraps the tubes in one direction for several turns, then in the other direction, and so forth. This technique provides transition points that lend to easy midspan access of a single buffer tube. The number of tubes used depends on the total number of fibers within the cable. Blank fillers are used as necessary to maintain a circular cable structure.

* Sumitomo's loose tube complies with the proposed RUS PE-90 which allows for up to 20 ft of exposed buffer tube. The window of exposed buffer tube should be kept to a minimum and not to exceed 20ft. Follow individual closure manufacturer's recommended entry window for best results.

<i>STANDARD CABLE CONFIGURATION BUFFER TUBE STRANDING and DIMENSIONS</i>			
TOTAL FIBERS IN CABLE	MAXIMUM FIBERS PER TUBE	NUMBER OF TUBES AND FILLERS	TUBE DIAMETER
2-60	12	5	2.5 mm (0.10 in)
72	12	6	2.5 mm (0.10 in)
74-108	12	9	2.5 mm (0.10 in)
110-144	12	12	2.5 mm (0.10 in)
146-216	12	18	2.5 mm (0.10 in)
218-288	12	24	2.5 mm (0.10 in)

2.5 Central Strength Member

The central strength member is made of a Fiberglass Reinforced Plastic (FRP). The FRP rod is most popular because of its all-dielectric properties, thus not requiring grounding. The FRP rod provides both tensile and anti-buckling strength to the cable. Some loose tube designs require a PE upjacketing of the central member to allow stranding of tubes in higher fiber count cables.

2.6 Cable Water Blocking

The interstices between the buffer tubes and the jacket layers are protected from water intrusion by a combination of dry waterblocking yarns and tapes. These dry materials are easily removed from the core during cable preparation without the use of cable cleaning solvents.

2.7 Additional Strength Elements

In addition to the FRP central strength member, aramid yarns are helically applied over the cable core to provide additional tensile strength to the cable.

2.8 Cable Sheath

2.8.1 All-Dielectric

A black medium density polyethylene (MDPE) jacket is extruded over the cable core as the sheath. Two durable, highly visible ripcords are placed under the jacket approximately 180° apart to aid in sheath removal.

2.8.2 Single Jacket - Armored

The Single Jacket - Armored cable's sheath consists of a co-polymer coated steel tape which is corrugated and wrapped directly over the cable core. This steel armor provides additional cable compression strength and rodent protection. The armor is covered with an outer black MDPE jacket. Ripcords are placed underneath the armor for easy sheath removal.

2.9 Sheath Marking

The entire length of each cable is marked with the following items:

- "SUMITOMO OPTICAL CABLE"
- Month and Year of Manufacture
- Sequential Length Markings in feet (optional meters)
- Telephone Handset Symbol per NESC Section 350G

All length markings are placed at two foot intervals (one meter intervals if metric length markings are specified). The actual cable length will be within +1%, -0% of the marked length. All markings are in indented in permanent white characters. If remarking is required, yellow markings are used to correct the error in the original markings.

2.10 Cable Dimensions

DRICORE® LOOSE TUBE CABLE DIMENSIONS			
SHEATH	FIBER COUNT	NOMINAL DIAMETER	NOMINAL WEIGHT
All-Dielectric	2 – 60	10.0 mm (0.39 in)	79 Kg/km (53 lbs/kft)
SE - *NK	72	11.1 mm (0.44 in)	92 Kg/km (62 lbs/kft)
	74 – 108	13.2 mm (0.52 in)	139 Kg/km (94 lbs/kft)
	110 – 144	15.6 mm (0.61 in)	189 Kg/km (127 lbs/kft)
	146 – 216	16.7 mm (0.66 in)	212 Kg/km (143 lbs/kft)
	218 – 288	18.6 mm (0.73 in)	255 Kg/km (172 lbs/kft)
Single Jacket -	2 – 60	11.6 mm (0.46 in)	133 Kg/km (89 lbs/kft)
Single Armor	72	13.7 mm (0.54 in)	177 Kg/km (119 lbs/kft)
SE - *NE	74 – 108	16.2 mm (0.64 in)	248 Kg/km (167 lbs/kft)
	110 – 144	18.6 mm (0.73 in)	315 Kg/km (212 lbs/kft)
	146 – 216	19.7 mm (0.77 in)	381 Kg/km (255 lbs/kft)
	218 – 288	21.6 mm (0.85 in)	402 Kg/km (270 lbs/kft)

3. Cable Performance

The finished cables can be subjected to the following mechanical and environmental conditions without a permanent increase in attenuation or damage to the cable.

3.1 Mechanical Performance

<i>MECHANICAL PERFORMANCE</i>			
PROPERTY		TEST PROCEDURE	SPECIFICATION
Low and High Temperature Cable Bend		EIA/TIA-455-37	20 x cable O.D. @ -30°C and 60°C
Impact Resistance		EIA/TIA-455-25	25 impact cycles
Compressive Strength:	All-Dielectric Armored	EIA/TIA-455-41	220 N/cm (124 lbs/in.) 440 N/cm (248 lbs/in.)
Maximum Tensile Load:	During Installation During Service	EIA/TIA-455-33	2700 N (600 lbs) 890 N (200 lbs)
Cable Twist		EIA/TIA-455-85	2 meter length \pm 180°
Cable Cyclic Flexing		EIA/TIA-455-104	20 x cable O.D. 25 cycles
Minimum Bend Radius:	During Installation During Service	EIA/TIA-455-37	20 x cable O.D. 10 x cable O.D.
Gopher Resistance (Armored only)		Bellcore GR-20	Index Rating \leq 3

3.2 Environmental Performance

<i>ENVIRONMENTAL PERFORMANCE</i>			
PROPERTY		TEST PROCEDURE	SPECIFICATION
Temperature:	Operation Installation Storage / Shipping	EIA/TIA-455-3	-40 to +70 °C (-40 to +158 °F) -30 to +60 °C (-22 to +140 °F) -40 to +75 °C (-40 to +167 °F)
Cable Aging		EIA/TIA-455-3	168 hours @ 85°C
Cable Freezing		EIA/TIA-455-98	Frozen in Ice
Water Penetration		EIA/TIA-455-82	1 meter for 24 hours
Compound Drip Temperature		EIA/TIA-455-81	80 °C (176 °F)
Wasp Spray Exposure		Bellcore GR-20	No Deterioration
Color Coding Permanence		Bellcore GR-20	Colors are Stable after Aging
Lightning Damage (Armored only)		EIA/TIA-455-181	Exceeds Category 1
Current Carrying Capacity (Armored)		Bellcore GR-20	60 Amp, 60 Hz

4. Testing and Inspection

The optical properties of all fibers are measured prior to cable manufacturing and remain traceable throughout the manufacturing process and the lifetime of the cable.

After cabling, we use statistical process control techniques along with periodic verification to insure 100% compliance to attenuation requirements in each length of cable with bi-directional OTDR at all operating wavelengths. Cable dimensional measurements are also made at final inspection and recorded.

5. Packaging and Shipping

Cable is supplied in lengths specified at the time of purchase. Each length will be shipped on a separate non-returnable wooden reel or if specified, a returnable steel reel. The minimum barrel diameter of the reel will not be less than 30 times the cable diameter.

The cable on each reel will be completely covered with a thermal wrap which is fastened to the cable by packaging straps. This wrap is reusable and provides excellent thermal and UV protection to cables sitting in reel yards.

The cable ends will be sealed with plastic protection caps to prevent water penetration and the escape of water blocking gel. The ends will be easily accessible for testing. Optional pulling grips may be factory installed if specified at the time of purchase.

<i>REEL DIMENSIONS</i>					
REEL TYPE	REEL CODE	FLANGE DIAMETER	REEL WIDTH	REEL WEIGHT	
Wood	L-3	850 mm (34 in.)	580 mm (23 in.)	32 Kg	(70 lbs)
	L-8	1050 mm (41 in.)	760 mm (30 in.)	61 Kg	(134 lbs)
	L-11	1250 mm (49 in.)	760 mm (30 in.)	91 Kg	(200 lbs)
	L-15	1350 mm (53 in.)	910 mm (36 in.)	106 Kg	(233 lbs)
	L-18	1500 mm (59 in.)	910 mm (36 in.)	133 Kg	(293 lbs)
	L-21	1600 mm (63 in.)	1050 mm (42 in.)	214 Kg	(471 lbs)
	L-25	1800 mm (71 in.)	1050 mm (42 in.)	246 Kg	(541 lbs)
	L-27	1850 mm (73 in.)	1120 mm (44 in.)	294 Kg	(647 lbs)
	L-29	1950 mm (77 in.)	1120 mm (44 in.)	307 Kg	(676 lbs)
	L-37	2210 mm (87 in.)	1240 mm (49 in.)	421 Kg	(927 lbs)
	L-46	2440 mm (96 in.)	1240 mm (49 in.)	504 Kg	(1108 lbs)
	Steel	414	1270 mm (50 in.)	810 mm (32 in.)	109 Kg
415		1420 mm (56 in.)	810 mm (32 in.)	130 Kg	(285 lbs)
416		1680 mm (66 in.)	810 mm (32 in.)	155 Kg	(340 lbs)
417		1980 mm (78 in.)	840 mm (33 in.)	241 Kg	(530 lbs)
420		2130 mm (84 in.)	1220 mm (48 in.)	350 Kg	(770 lbs)
421		2290 mm (90 in.)	1220 mm (48 in.)	405 Kg	(890 lbs)
422		2440 mm (96 in.)	1220 mm (48 in.)	539 Kg	(1185 lbs)

Each reel is marked with the manufacturer's name and address, cable type, fiber count, attenuation specs, and cable length. A final inspection test report with attenuation performance data for each fiber is attached to the reel flange along with shipping labels.

REEL USAGE								[ft.]	[m]	CABLE LENGTH
WOOD STEEL	REEL CODES									
	L-18 417	L-25 420	L-29 420	L-37 421	L-46 NA	NA NA	NA NA	30,000	9,140	
L-15 416	L-21 417	L-25 420	L-37 420	L-46 422	L-46 NA	NA NA	25,000	7,620		
L-15 416	L-18 417	L-25 420	L-29 420	L-37 421	L-46 422	L-46 NA	20,000	6,100		
L-11 415	L-15 416	L-21 417	L-25 420	L-27 420	L-37 420	L-37 421	15,000	4,570		
L-8 414	L-11 415	L-15 416	L-21 417	L-21 417	L-27 420	L-37 420	10,000	3,050		
L-8 414	L-11 414	L-15 415	L-21 416	L-21 417	L-27 417	L-37 420	7,500	2,290		
L-8 414	L-8 414	L-11 414	L-21 415	L-21 416	L-27 416	L-37 417	5,000	1,520		
L-3 414	L-3 414	L-11 414	L-21 414	L-21 414	L-27 414	L-37 415	2,500	760		
[in.]	0.4	0.5	0.6	0.7	0.8	0.9	1.0			
[mm]	10.2	12.7	15.2	17.8	20.3	22.9	25.4			
CABLE DIAMETER										

NOTE: Actual reel size used will depend on production capacity, net weight, and reel availability. Check with your sales representative for more details.

6. Installation / Handling Practices

Sumitomo has incorporated a wide range of technical support and training services for our fiber optic cable products into our Technical Support Services (TSS) program. TSS offers training in the areas of cable installation, sheath entry, splicing, testing, and system troubleshooting. The services are available in a variety of media formats and can be customized to better accommodate individual training needs. The TSS program consists of an extensive series of recommended procedure documents, training courses with classroom and hands-on instruction, as well as demonstrational video tapes. Please contact Sumitomo's Customer Service department for more information.

7. Ordering Information

To learn more about Sumitomo's cables or to place an order, call, fax, e-mail, or write us at:

*Sumitomo Electric Lightwave Corp.
78 Alexander Drive
Research Triangle Park, NC 27709
Attn: Customer Service Department*

*Phone: 800-358-7378
919-541-8100
Fax: 919-541-8265
E-mail: info@sumitomoelectric.com*

Sumitomo Electric Lightwave Corp. reserves the right to improve, enhance, or modify the cable's features and specifications. For special requirements different than those shown above, please contact our Inside Sales Department. Each Sumitomo Electric Lightwave Corp. optic cable and/or its manufacture may be covered by one or more of the following US Patents: 4,715,677 4,729,629 4,763,983 4,770,489 4,828,349 4,953,945 5,043,037 5,082,347 5,165,003 D331,567 5,247,599 5,410,901 5,471,555 5,642,452. Cable and/or its manufacture may be covered by one or more of the following US Patents: 4,715,677 4,729,629 4,763,983 4,770,489 4,828,349 4,953,945 5,043,037 5,082,347 5,165,003 D331,567 5,247,599 5,410,901 5,471,555 5,642,452.