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SUMITOMO PRODUCT SPECIFICATION

FutureFLEX®

**TCxxMTX INDOOR/OUTDOOR TUBE CABLE SERIES
FOR USE IN MASS TRANSIT APPLICATIONS, NUCLEAR PLANTS,
CLASS 1 DIV. 1 & 2 APPLICATIONS**



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SEL is a Member of the Sumitomo Electric Industries, Ltd. Group

Sumitomo Electric Lightwave reserves the right to improve or modify these specifications without notice.

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1.0 General

This specification covers the design requirements and performance standards for FutureFLEX® Air-Blown Fiber® (ABF) indoor/outdoor Low Smoke Zero Halogen tube cables. The features described in this document are intended to provide information on the performance of Sumitomo Electric's FutureFLEX® tube cables and aid in handling and use.

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1.1 Tube Cable Description

Sumitomo's FutureFLEX® MTX (Low Smoke Zero Halogen) series tube cables for Mass Transit, Nuclear Plants, Class 1 Division 1 & 2 applications are designed for use as an optical fiber cabling infrastructure in ABF applications which meet UL 1581, UL 1685 LS, NFPA 130 (Standard for Fixed Guideway Transit and Passenger Rail Systems) cabling requirements, ICEA 640 and OFN-LS. These requirements include FT4 / IEEE1202 exposure requirements for char height, total smoke released, and peak smoke released rate of ANSI/UL 1685. Mass Transit Tube Cables may also be used in indoor applications where: 1) lesser fire ratings, such as Optical Fiber Nonconductive – General Purpose (OFN) apply or 2) no fire ratings apply. The individual tubes have a 6mm inside diameter and 8mm outside diameter. A non-conductive non-woven water blocking tape wrap surrounds the tube bundle and provides the necessary protection for use in outdoor applications. The jacket is made of non-halogen fire retardant thermoplastic and is cable tray rated. Ripcords are provided to aid in jacket removal. These tube cables are pulled or placed in routes for the purpose of individual tube connections to establish pathways for FutureFLEX® fiber bundle installation.

1.2 Quality

Sumitomo ensures a continuing high level of quality through ISO / TL9000 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 tube cables' performance and durability in a field environment.

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

2.0 TUBE CABLE DESIGN

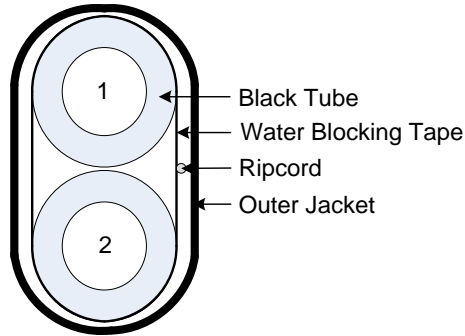
2.1 General

Sumitomo's FutureFLEX® MTX Mass Transit indoor/outdoor riser rated series tube cables for NFPA130 applications provide a small diameter, lightweight, pathway for FutureFLEX® fiber bundle installations. FutureFLEX® ABF fiber bundles are available in Single-mode OS1, 62.5 micron Multimode OM1, 1-Gigabit 50 micron Multimode OM2, Laser Optimized 10-Gigabit 50 micron Multimode OM3, and Laser Optimized 10-Gigabit 50 micron Multimode OM4 versions with 2, 4, 6, 12, 18, 24, or 48 fiber strand counts. One fiber bundle can be field-installed in each tube.

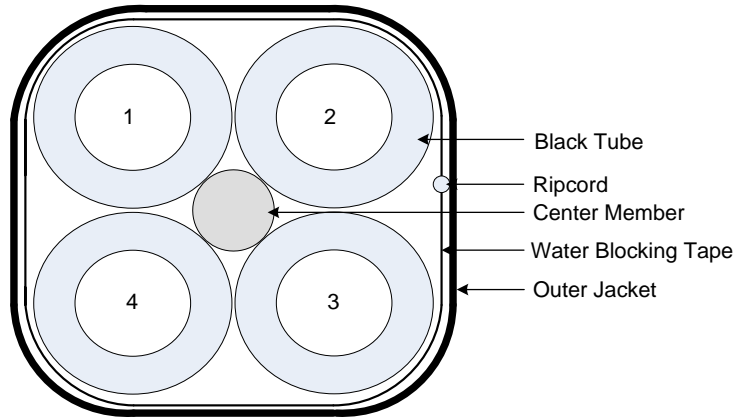
2.2 Construction

SEL Part Number	Product Description	Outside Diameter (in.)	Max. Weight (lbs./kft.)	Max. Tensile Load (lbs.)
TC02MTX	2-tubes, black, non-woven glass tape wrap, ripcord and black non-halogen fire retardant thermoplastic outer jacket	.811	140	200
TC04MTX	4- tubes, black, black fire retardant polyethylene center member, water blocking tape wrap, ripcord, and black non-halogen fire retardant thermoplastic outer jacket	.968	244	300
TC07MTX	7- tubes, black, non-woven glass tape wrap, ripcord, and black non-halogen fire retardant thermoplastic outer jacket	1.14	338	400
TC19MTX	19- tubes, black, non-woven glass tape wrap, ripcord, and black non-halogen fire retardant thermoplastic outer jacket	1.78	671	500

Drawings Not To Scale

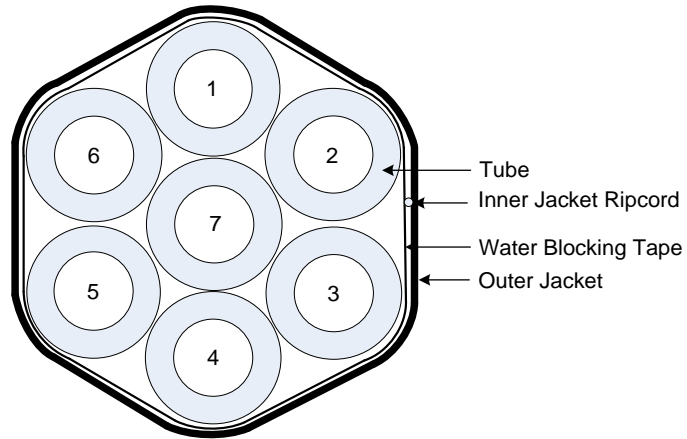


2-Tube
Mass Transit Tube Cable
TC02MTX

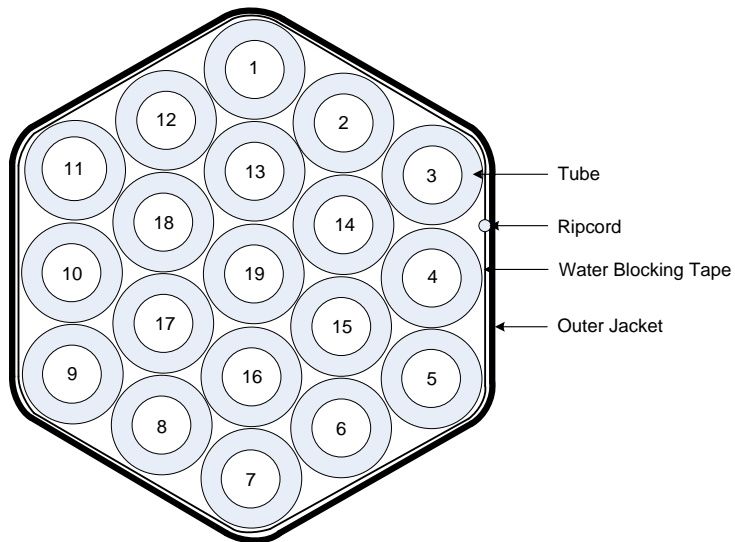


4-Tube
Mass Transit Tube Cable
TC04MTX

Drawings Not to Scale



7-Tube
Mass Transit Tube Cable
TC07MTX



19-Tube
Mass Transit Tube Cable
TC19MTX

3.0 TUBE CABLE CHARACTERISTICS

3.1 Performance

Property	Specification
Operation Temperature Range	-40° to +75° C
Minimum Bend Radius (During / After Installation)	20 / 10 x tube cable outside diameter

3.2 Tube Markings

The outside surface of each jacketed cable is marked every two (2) feet with the following information:

'Phone receiver symbol' SEL FutureFLEX® (SEL Part No.) Type OFNG-LS / FT4 ETL Listed c(ETL)us Field Assembled Optical Fiber Cable (Manufacturing Lot #) (Seq. Ftg.) 1-877-356-FLEX WWW.FUTUREFLEX.COM ←

The outside surface of each tube is marked every two (2) inches with the tube designation number (1 through 19) approximately every two inches.

3.3 Reel Markings

The outside of each flange is marked with the Sumitomo Electric Lightwave Corp. product part number, the tube cable manufactured length in feet, and the text "Do Not Lay Flat."

3.4 Tube Cable Ends

Both ends of the tube cable are accessible on the reel. Each tube is sealed with a plastic cap or plug. Tube cable ends are sealed with a heat shrink end cap.

3.5 Reel Lengths

Sumitomo Part No.	Std. Reel Length (ft.)	Std. Reel H x W (in.)	Minimum Drum Diameter (in.)	Std. Reel Weight (lbs.) Empty	Std. Reel Weight (lbs.) Full
TC02MTX	1000	54 x 36	40	137	277
TC04MTX	1000	54 x 36	40	137	381
TC07MTX	1000	54 x 39	40	308	646
TC19MTX	1000	60x 49	40	420	1091

Notes:

- Standard Reel Length tolerances are $\pm 5\%$
- All Reel Widths shown are approximate values only and measured across outside-of-flanges
- If tube cable is re-spoiled, the Minimum Drum Diameter of the new reel shall be as shown to avoid damaging tube cable product
- All Empty and Full Reel Weights shown are approximate values only

3.6 Maximum Reel Lengths

Sumitomo Part No.	Max Reel Length (ft.)	Max Reel H x W (in)	Minimum Drum Diameter (in)	Max Reel Weight (lbs.) Empty	Max Reel Weight (lbs.) Full
TC02MTX	3000	60 x 49	40	420	840
TC04MTX	3000	60 x 49	40	420	1152
TC07MTX	3000	72 x 49	40	523	1537
TC19MTX	2000	72 x 49	40	523	1865
TC19MTX	3000	72 x 45	30	543	2559

Notes:

- Standard Reel Length tolerances are $\pm 5\%$
- All Reel Widths shown are approximate values only and measured across outside-of-flanges
- If tube cable is re-spoiled, the Minimum Drum Diameter of the new reel shall be as shown to avoid damaging tube cable product
- All Empty and Full Reel Weights shown are approximate values only

4.0 BLOWING PERFORMANCE / TESTING

Each finished tube cable on its reel is required to pass a 5mm diameter steel ball from end to end using 70 psi (+/-10 psi) gas pressure.

5.0 INSTALLATION / HANDLING PRACTICES

Sumitomo has incorporated a wide range of technical support and training services for our tube 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. Please contact Sumitomo's Customer Service department for more information.

6.0 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.
201 South Rogers Lane
Suite 100
Raleigh, NC 27610
Attn: Customer Service Department

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

Sumitomo Electric Lightwave 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.