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SUMITOMO PRODUCT SPECIFICATION

FutureFLEX®

TCxxMTIO & TCxxMTIO-4 INDOOR/OUTDOOR TUBE CABLE SERIES FOR USE IN MASS TRANSIT APPLICATIONS, NUCLEAR PLANTS, CLASS I DIV. 1 & 2 APPLICATIONS - ZERO HALOGEN JACKET CABLES

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

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1.0 General

This specification covers the design requirements and performance standards for FutureFLEX® Air-Blown Fiber® (ABF) indoor/outdoor tube cables with Low Smoke Zero Halogen jackets. 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.

1.1 Tube Cable Description

Sumitomo's FutureFLEX® TCxxMTIO (Low Smoke) series tube cables for Mass Transit, Nuclear Plants, Class I Division 1 & 2 applications are designed for use as an optical fiber cabling infrastructure in ABF applications which meet OFNR, Riser Rated, Low Smoke - UL1651, UL1666, UL1685, ICEA 640, OFN-LS, cUL FT4, IEEE1202, CSA FT4 and NFPA 130 Listed. The cUL FT4, and IEEE1202 include exposure requirements for char height, total smoke released, and peak smoke released rate as stated in ANSI/UL1685. These ratings are the standard for "Fixed Guideway Transit and Passenger Rail Systems" cabling requirements. The outer jacket of the Armor is made of Zero Halogen fire retardant thermoplastic and is cable tray rated.

Sumitomo's FutureFLEX® TCxxMTIO-4 (Low Smoke) armored tube cable series is identical to the TCxxMTIO cable and has an overjacket of galvanized steel interlocked armor requiring Grounding and Bonding in accordance with EIA/TIA 607 Standards. The TCxxMTIO-4 tube cables also incorporate an outer jacket covering the armor comprised of material which is listed as Zero Halogen by UL under UL 2885 and meets the intent of ICEA 655 Guide for Low-Smoke, Zero Halogen (LSZH) Polymeric Cable Jackets. The Armored MTIO Cables also meets: OFCR, UL1581, ICEA 640 standards. 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 Conductive – General Purpose (OFCG) apply or 2) no fire ratings apply. The individual tubes have a 6mm inside diameter and 8mm outside diameter. A non-conductive water blocking tape wrap surrounds the tube bundle and provides the necessary protection for use in outdoor applications. The jacket is made of Zero 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

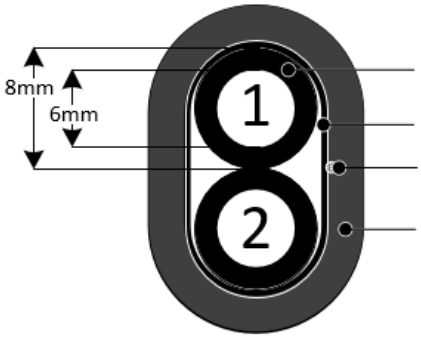
Sumitomo's FutureFLEX® MTIO/MTIO-4 Mass Transit indoor/outdoor riser rated series tube cables for NFPA130 applications provide a small diameter, lightweight, pathway for FutureFLEX® fiber bundle installations. FutureFLEX® ABF fiber bundles are available in Single-mode OS2, 62.5 micron Multimode OM1, 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 6, 12, 24, 48 fiber strand counts. 72 fiber strand bundles are available in single-mode only. One fiber bundle can be field-installed in each tube. (Refer SEL Drawing: SD-F04-009 for MTIO and SEL Drawing: SD-F04-010 for MTIO-4)

2.2 Construction

SEL Part Number	Product Description	Outside Diameter (in.)	Max. Weight (lbs./kft.)	Max. Tensile Load (lbs.)
TC02MTIO	2 - Tubes, Black, Water Blocking Tape Wrap, Ripcord and Black Fire Retardant, Limited Smoke, Thermoplastic Outer Jacket. (Riser)	0.84	128	200
TC04MTIO	4 - Tubes, Black, Water Blocking Tape Wrap, Black Fire Retardant Polyethylene Center Member, Ripcord and Black Fire Retardant, Limited Smoke, Thermoplastic Outer Jacket. (Riser)	0.97	235	400
TC07MTIO	7 - Tubes, Black, Water Blocking Tape Wrap, Ripcord and Black Fire Retardant, Limited Smoke, Thermoplastic Outer Jacket. (Riser)	1.15	336	500
TC12MTIO	12 - Tubes, Black, Water Blocking Tape Wrap, Ripcord and Black Fire Retardant, Limited Smoke, Thermoplastic Outer Jacket. (Riser)	1.43	437	500
TC19MTIO	19 - Tubes, Black, Water Blocking Tape Wrap, Ripcord and Black Fire Retardant, Limited Smoke, Thermoplastic Outer Jacket. (Riser)	1.78	672	500

SEL Part Number	Product Description	Outside Diameter (in.)	Max. Weight (lbs./kft.)	Max. Tensile Load (lbs.)
TC02MTIO-4	2 - Tubes, Black, Water Blocking Tape Wrap, Ripcord and Black Fire Retardant, Limited Smoke, Thermoplastic Outer Jacket encased in Galvanized Steel Interlocked Armor with a LSZH Jacket. (Riser)	1.20	531	400
TC04MTIO-4	4 - Tubes, Black, Water Blocking Tape Wrap, Black Fire Retardant Polyethylene Center Member, Ripcord and Black Fire Retardant, Limited Smoke, Thermoplastic Outer Jacket encased in Galvanized Steel Interlocked Armor with a LSZH Jacket. (Riser)	1.38	623	600
TC07MTIO-4	7 - Tubes, Black, Water Blocking Tape Wrap, Ripcord and Black Fire Retardant, Limited Smoke, Thermoplastic Outer Jacket encased in Galvanized Steel Interlocked Armor with a LSZH Jacket. (Riser)	1.50	1001	600
TC12MTIO-4	12 - Tubes, Black, Water Blocking Tape Wrap, Ripcord and Black Fire Retardant, Limited Smoke, Thermoplastic Outer Jacket encased in Galvanized Steel Interlocked Armor with a LSZH Jacket. (Riser)	1.77	1223	600
TC19MTIO-4	19 - Tubes, Black, Water Blocking Tape Wrap, Ripcord and Black Fire Retardant, Limited Smoke, Thermoplastic Outer Jacket encased in Galvanized Steel Interlocked Armor with a LSZH Jacket. (Riser)	2.17	1850	600

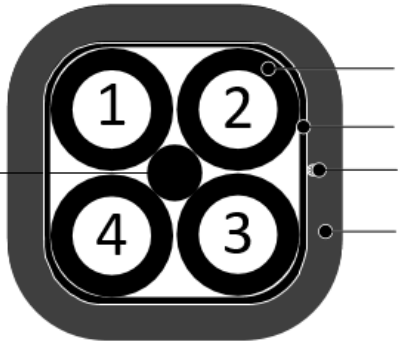
Drawings Not To Scale



Black Fire Retardant (PE) Tubes
Water Blocking Tape
Ripcord
Black Fire Retardant (Limited Smoke) Thermoplastic Outer Jacket

TC02MTIO

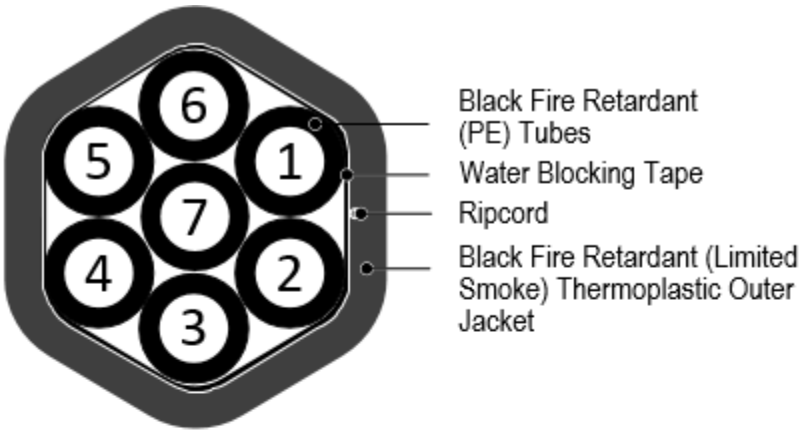
Black Fire Retardant Polyethylene Center Member: Not for Pulling



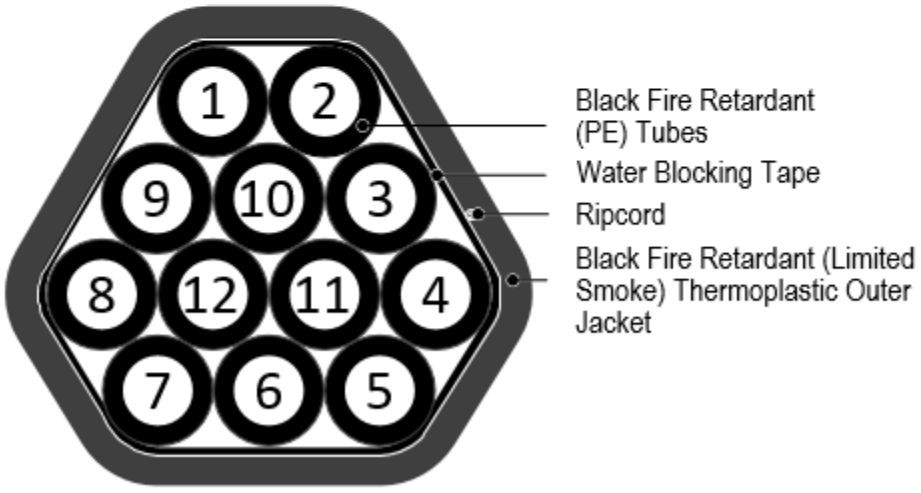
Black Fire Retardant (PE) Tubes
Water Blocking Tape
Ripcord
Black Fire Retardant (Limited Smoke) Thermoplastic Outer Jacket

TC04MTIO

Drawings Not To Scale



TC07MTIO



TC12MTIO

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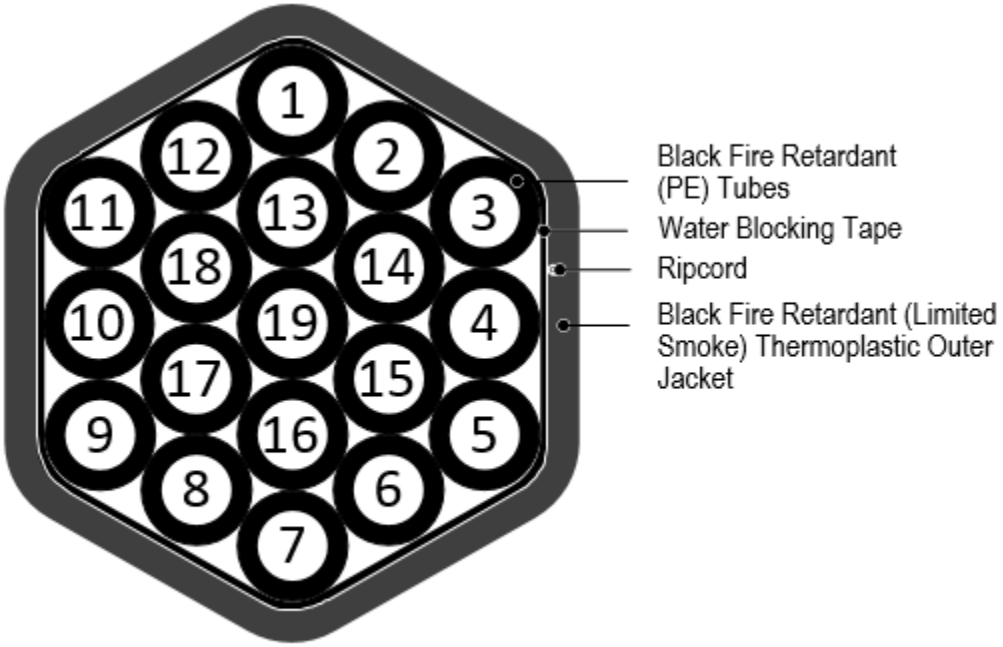
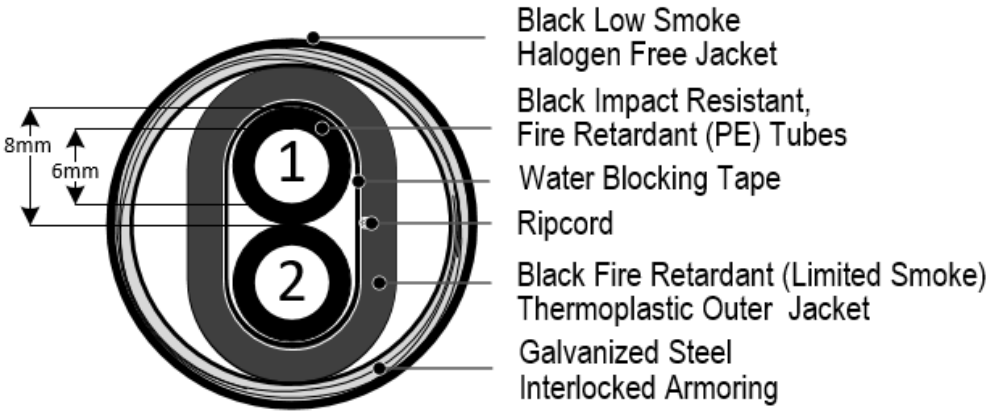
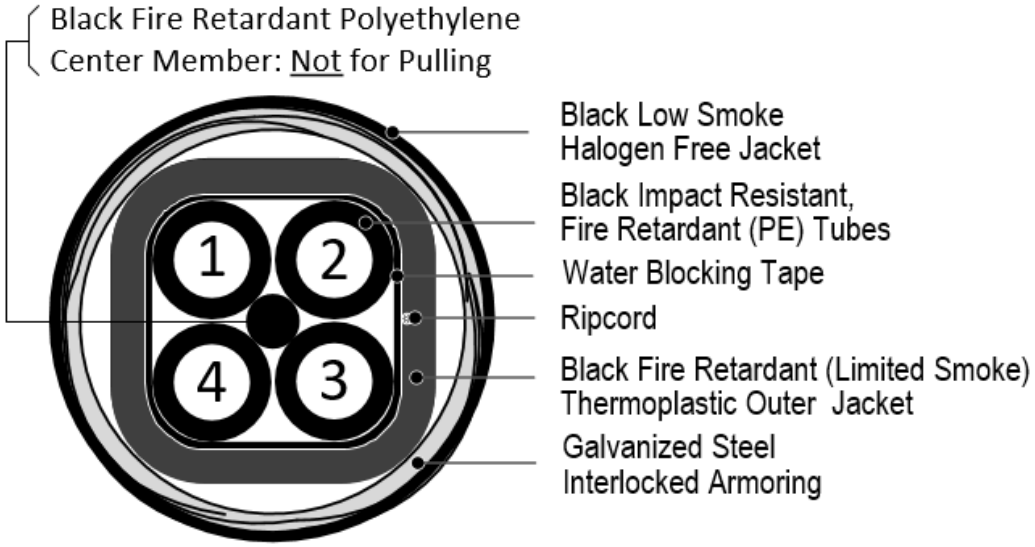


TC19MTIO

Drawings Not To Scale



TC02MTIO-4



TC04MTIO-4

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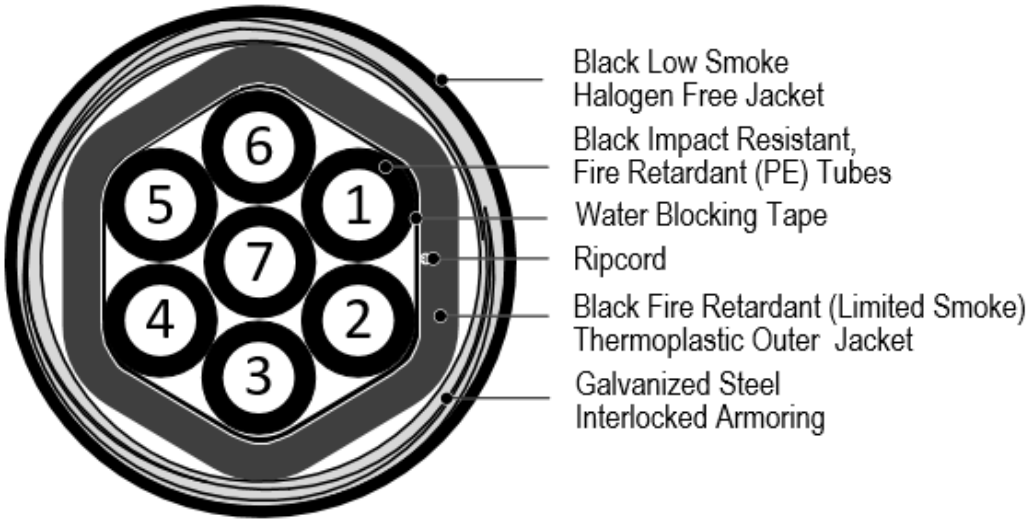
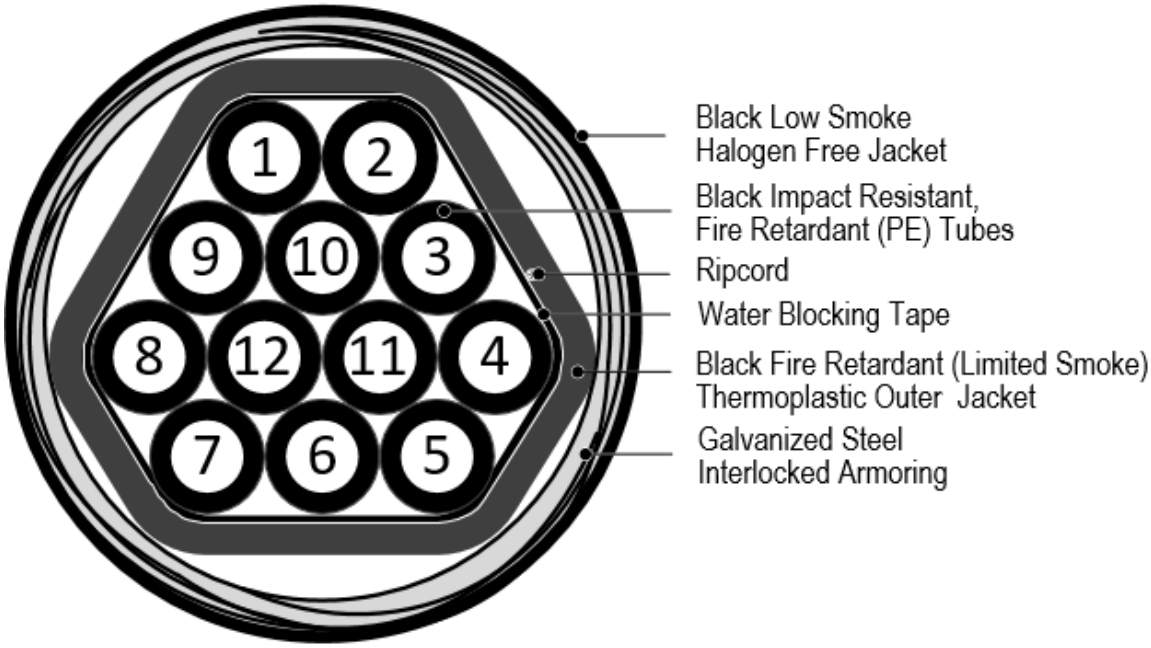


TC07MTIO-4



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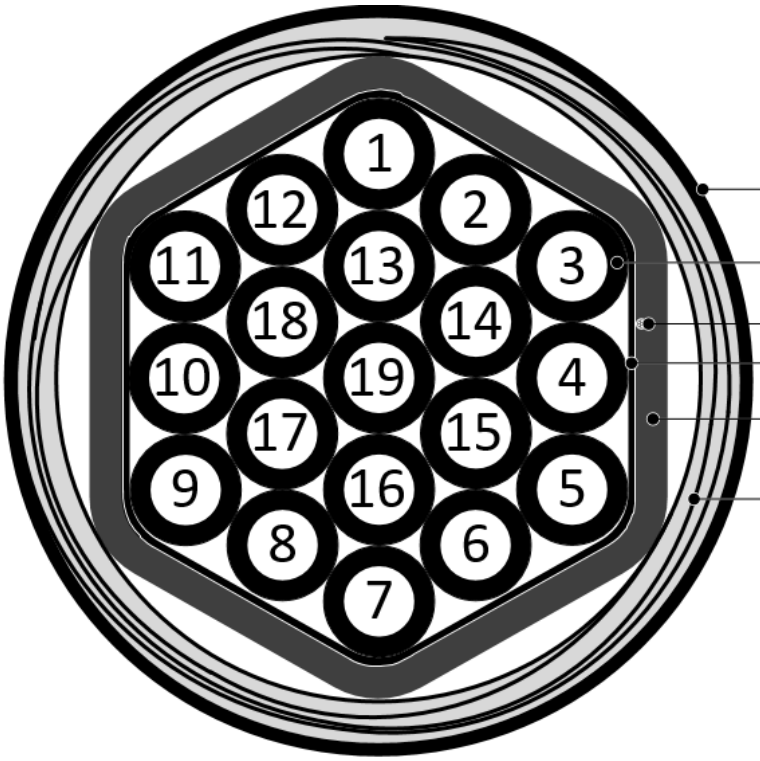

Black Low Smoke
Halogen Free Jacket

Black Impact Resistant,
Fire Retardant (PE) Tubes

Ripcord

Water Blocking Tape

Black Fire Retardant (Limited Smoke)
Thermoplastic Outer Jacket

Galvanized Steel
Interlocked Armoring

TC19MTIO-4

3.0 TUBE CABLE CHARACTERISTICS

3.1 Performance

Property	Specification
Operation Temperature Range	-40°F to +158°F (-40°C to +70°C) (ICEA 696)
Minimum Bend Radius (During / After Installation)	20 / 10 x tube cable outside diameter

3.2 Cable and Tube Markings

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

TCxxMTIO Cables:

- **SEL FutureFLEX® (SEL Part No.) Type OFNR-FT4-ST1 UL Listed c(UL) Field Assembled Optical Fiber Cable (Manufacturing Lot #) (Seq. Ftg.) 1-877-356-FLEX WWW.SUMITOMOELECTRICLIGHTWAVE.COM ←**

TCxxMTIO-4 Cables:

- **SEL FutureFLEX® (SEL Part No.) Type OFCR-FT4-ST1 UL Listed c(UL) Armored Field Assembled Optical Fiber Cable (Manufacturing Lot #) (Seq. Ftg.) 1-877-356-FLEX WWW.SUMITOMOELECTRICLIGHTWAVE.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 TCxxMTIO Reel Data

Sumitomo Part No.	Minimum Reel Length (ft.)	Minimum Reel H x W (in.)	Minimum Drum Diameter (in.)	Minimum Reel Weight (lbs.) Empty	Minimum Reel Weight (lbs.) Full
TC02MTIO	1000	54 x 16	40	116	256
TC04MTIO	1000	54 x 16	40	116	361
TC07MTIO	1000	50 x 32	40	137	475
TC12MTIO	1000	60 x 42	40	420	857
TC19MTIO	1000	60 x 42	40	420	1092
TC02MTIO	3000	60 x 42	40	420	840
TC04MTIO	3000	60 x 42	40	420	1155
TC07MTIO	3000	60 x 42	40	420	1434
TC12MTIO	3000	72 x 45	36	543	1854
TC19MTIO	3000	72 x 45	36	543	2559

Notes:

- Standard Reel Length tolerances are ±5%
- All Reel Widths shown are approximate values only and measured across outside-of-flanges
- If tube cable is re-spooled, 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 TCxxMTIO-4 Reel Data

Sumitomo Part No.	Standard & Max Reel Length (ft.)	Standard & Max Reel H x W (in)	Minimum Drum Diameter (in)	Standard & Max Reel Weight (lbs.) Empty	Standard & Max Reel Weight (lbs.) Full
TC02MTIO	1000	60 x 32	40	410	940
TC04MTIO	1000	60 x 32	40	410	1033
TC07MTIO	1000	72 x 42	40	652	1653
TC12MTIO	1000	84 x 54	40	930	2153
TC19MTIO	1000	84 x 54	40	930	2780
TC02MTIO-4	3000	60 x 49	30	410	2124
TC04MTIO-4	3000	60 x 49	30	410	2279
TC07MTIO-4	3000	72 x 49	36	652	3655
TC12MTIO-4	3000	84 x 54	42	930	4599
TC19MTIO-4	3000	84 x 61	42	930	6480

Notes:

- Standard Reel Length tolerances are ±5%
- All Reel Widths shown are approximate values only and measured across outside-of-flanges
- If tube cable is re-spooled, 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 TESTING / BLOWING PERFORMANCE

Each finished tube cable on its reel is required to pass a 5mm diameter 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
URL: www.sumitomoelectriclightwave.com