3M™ Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series

5, 8, 15, 25/28 and 35 kV

Data Sheet September 2016

Description	3M Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series, contain one-piece, non-skirted, silicone rubber terminations, qualified as IEEE Standard 48 Class 1 for indoor and weather-protected applications. The termination assemblies consist of a tubular insulator, high dielectric constant (High-K) stress control tube*, conformable High-K stress controlling compound and built-in environmental top sealing compound. The insulator is made of dark gray silicone rubber with advanced tracking resistance and hydrophobic properties. *The 7620-T termination is designed and assembled with stress controlling compound only. The complete assembly is pre-stretched and loaded onto a removable core. The disposable core can be recycled. The kits are designed for terminating solid dielectric shielded power cable rated 5 through 35 kV, with Tape Shield, Wire Shield and UniShield® constructions.
Kit Contents	Each kit contains sufficient quantities of the following materials to make three single-phase terminations (lugs are not included in kit). • 3 High-K, Tracking Resistant, Silicone Rubber Indoor Tubular Terminations • 3 Pre-formed Ground Braids • 3 Constant Force Springs • 6 Strips Scotch® Mastic Strip 2230 (black with white release liners, bagged) • 1 3M Cable Cleaning Preparation Kit CC-2 • 3 3M EMI Copper Foil Shielding Tape 1181 Strips, 1/2" x 10" • 1 Instruction sheet

3M™ Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series

Features

- Conforms to IEEE Standard 48, Class 1 requirements for 5, 8, 15, 25/28 and 35 kV terminations
- One-piece versatile design, allowing quick installation and accommodating a wide range of cable sizes
- Cold shrink delivery system allows easy installation: Simply place termination over prepared cable and unwind core to shrink into place (no force fit required)
- High-K stress control: Specially formulated high-dielectric constant material minimizes surface stress by more uniformly distributing the electrical field over the entire surface of the insulator
- Compact design provides for easier installation in restricted spaces
- Silicone rubber insulators, EPDM stress control tubes, stress controlling compound and environmental sealing compound are compatible with common solid dielectric insulations, such as polyethylene (PE), cross-linked polyethylene (XLPE) and ethlylene propylene rubber (EPR).

Stress Control

The 3M Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series, control the electric field stress distribution with special High-K materials, which are an integral part of the termination. The High-K materials, with a dielectric constant (K) of greater than 15, capacitively distribute the field that surrounds the termination.

The stress concentrations in a continuous length of shielded cable are typically 50 V/mil adjacent to the shield to about 70 V/mil at the conductor. The 3M Cold Shrink QT-III Silicone Rubber Termination reduces the cable stresses at the termination to less than those in the continuous shielded portion of the cable.

Electrical flux is refracted to distribute the voltage stress in a controlled manner along the entire termination length extending beyond the cable shield cutoff. By controlling the electric field, the stress concentrations on the termination insulator surface are kept below 15 V/mil at rated voltage. This stress distribution permits high-power frequency performance and impulse performance with a compact termination design.

Figure 1 illustrates an actual computerized stress plot of the 3M Cold Shrink QT-III Silicone Rubber Termination.

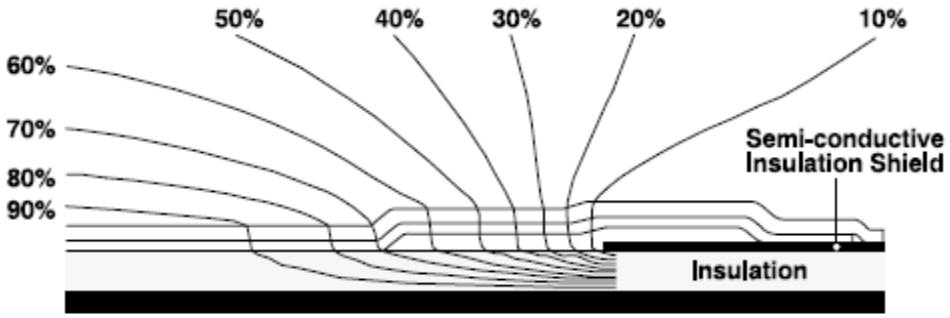


Figure 1

3M™ Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series

Applications	The 3M Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series, are designed for: • 5, 8, 15 and 25/28 and 35 kV voltage classes • Tape Shield, Wire Shield and UniShield® cables • Solid dielectric insulations, such as polyethylene, XLP and EPR • Contaminated and non-contaminated indoor (weather-protected) locations • Free-hanging or bracket-mounting arrangements • Upright or inverted installations • Switchgear, transformer, motor lead, bus and similar connections. • These terminations can be field-tested by using normal cable testing procedures (reference: IEEE Standard 400 “Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems”. Refer to most recent version).
Environmental Classification	Indoor terminations, such as 3M Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series, can be specified for most outdoor, pad-mounted switchgear and transformer applications, since these enclosure interiors are protected from direct exposure to the elements.

Typical Properties

Not for specifications. Values are typical, not to be considered minimum or maximum. Properties measured at room temperature 73°F (23°C) unless otherwise stated.

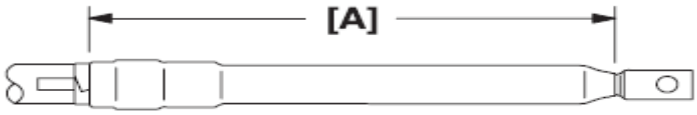
3M Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series, can be used on cables with a rated maximum operating temperature of 221°F (105°C) and emergency overload rating of 284°F (140°C).

Terminations constructed from these kits meet the requirements of IEEE 48, “IEEE Standard Test Procedures and Requirements for High Voltage Alternating-Current Cables Terminations” and are designated Class 1 for indoor or weather-protected locations. The current rating of these terminations meets or exceeds the current rating of the cables on which they are installed.

Termination Selection Table

Kit Number	Cable Insulation O.D. Range in. (mm)	Conductor Range (AWG and kcmil)				
		5 kV 100% 133%	8 kV 100% 133%	15 kV 100% 133%	25/28 kV 100% 133%	35 kV 100% 133%
7620-T-95	0.32” – 0.59” (8,1 - 15,0 mm)	8 – 4 --	8 – 6 --	-- --	-- --	-- --
7621-T-95	0.44” - 0.89” (11,2 - 22,6 mm)	2 – 3/0 --	4 – 2/0 --	-- --	-- --	-- --
7622-T-95	0.64” – 1.08” (16,3 – 27,4 mm)	4/0 – 400 --	3/0 – 300 --	-- --	-- --	-- --
7624-T-95	0.83” – 1.53” (21,1 – 38,9 mm)	500 – 750 --	350 – 700 --	-- --	-- --	-- --
7625-T-95	1.05” – 1.80” (26,7 – 45,7 mm)	700 – 1500 --	600 – 1250 --	-- --	-- --	-- --
7622-T-110	0.64” – 1.08” (16,3 – 27,4 mm)	4/0 – 400 --	3/0 – 300 --	2 – 2/0 (35 -70 mm^2)	-- --	-- --
7622-T-110(L)	0.69” – 1.22” (17,5 – 31,0 mm)	--	--	1/0 – 4/0 (60 -120 mm^2)	-- --	-- --
7623-T-110	0.72” – 1.29” (18,3 – 32,8 mm)	300 – 500 --	250 – 500 --	2/0 – 300 (70 -150 mm^2)	-- --	-- --
7624-T-110	0.83” – 1.53” (21,1 – 38,9 mm)	500 – 750 --	350 – 700 --	4/0 – 500 (120 – 240 mm^2)	-- --	-- --
7625-T-110	1.05” – 1.80” (26,7 – 45,7 mm)	700 – 1500 --	600 – 1250 --	500 – 1000 (240 – 500 mm^2)	-- --	-- --
7625-T-110(L)	1.15” – 1.98” (29,2 – 50,3 mm)	--	--	750 – 1000 (400 -500 mm^2)	-- --	-- --
7626-T-110	1.53” – 2.32” (38,9 – 58,9 mm)	1750 – 2000 --	1500 – 2000 --	1250 – 2000 (625 – 1000 mm^2)	-- --	-- --
7693-T-150	0.72” – 1.29” (18,3 – 32,8 mm)	300 – 500 --	250 – 500 --	2/0 – 300 (70 – 150 mm^2)	2 – 4/0 (35 – 120 mm^2)	2 – 2/0 (35 – 70 mm^2)
7695-T-150	1.05” – 1.80” (26,7 – 45,7 mm)	700 – 1500 --	600 – 1250 --	500 – 1000 (240 – 500 mm^2)	250 – 800 (150 - 400 mm^2)	3/0 – 600 (95 – 325 mm^2)
7695-T-150(L)	1.15” – 1.90” (29,2 – 48,3 mm)	--	--	750 – 1000 (400 -500 mm^2)	500 – 750 (240 -325 mm^2)	--
7696-T-150	1.53” – 2.32" (38,9 – 58,9 mm)	1750 – 2000 --	1500 – 2000 --	1250 – 2000 (625 – 1000 mm^2)	900 – 1750 (500 – 800 mm^2)	700 – 1500 (400 – 725 mm^2)

Typical Dimensions



Kit Number	Dimension [A] (Maximum)	Wet Creepage Distance (Maximum)	Arcing Distance (Maximum)
7620-T-95	8.5” (215 mm)	8.5” (215 mm)	8.5” (215 mm)
7621-T-95	8.5” (215 mm)	8.5” (215 mm)	8.5” (215 mm)
7622-T-95	8.5” (215 mm)	8.5” (215 mm)	8.5” (215 mm)
7624-T-95	8.5” (215 mm)	8.5” (215 mm)	8.5” (215 mm)
7625-T-95	8.5” (215 mm)	8.5” (215 mm)	8.5” (215 mm)
7622-T-110(L)	8.5” (215 mm)	8.5” (215 mm)	8.5” (215 mm)
7622-T-110	13.0” (330 mm)	13.0” (330 mm)	13.0” (330 mm)
7623-T-110	13.0” (330 mm)	13.0” (330 mm)	13.0” (330 mm)
7624-T-110	13.0” (330 mm)	13.0” (330 mm)	13.0” (330 mm)
7625-T-110	13.0” (330 mm)	13.0” (330 mm)	13.0” (330 mm)
7625-T-110(L)	13.0” (330 mm)	13.0” (330 mm)	13.0” (330 mm)
7626-T-110	13.0” (330 mm)	13.0” (330 mm)	13.0” (330 mm)
7693-T-150	16.5” (419 mm)	16.5” (419 mm)	16.5” (419 mm)
7695-T-150	16.5” (419 mm)	16.5” (419 mm)	16.5” (419 mm)
7695-T-150(L)	16.5” (419 mm)	16.5” (419 mm)	16.5” (419 mm)
7696-T-150	16.5” (419 mm)	16.5” (419 mm)	16.5” (419 mm)

Typical Properties

Not for specifications. Values are typical, not to be considered minimum or maximum. Properties measured at room temperature 73°F (23°C) unless otherwise stated.

High-K Stress Control Tube

Physical Properties (Test Method)	Typical Value English Units (Metric)
Tensile Strength (ASTM D412 Test Method)	1500 psi (10,34 N/mm^2)
Modulus @ 100% Elongation Modulus @ 300% Elongation	160 psi (1,10 N/mm^2) 500 psi (3,45 N/mm^2)
Electrical Properties (Test Method)	**Typical Value**
Dielectric Constant (K) (ASTM D150) 60 Hz @ 1000 V; 73°F (23°C), 50% RH	22
Dissipation Factor (ASTM D150) 60 Hz @ 1000 V; 73°F (23°C), 50% RH	0.10

High-K Stress Controlling Compound

Electrical Properties (Test Method)	Typical Value
Dielectric Constant (K) (ASTM D150) 60 Hz @ 1000 V; 73°F (23°C), 50% RH 100 mil (2,54 mm) thickness	25
Dissipation Factor (ASTM D150) 60 Hz @ 1000 V; 73°F (23°C), 50% RH 100 mil (2,54 mm) thickness	0.90

Environmental Sealing Compound

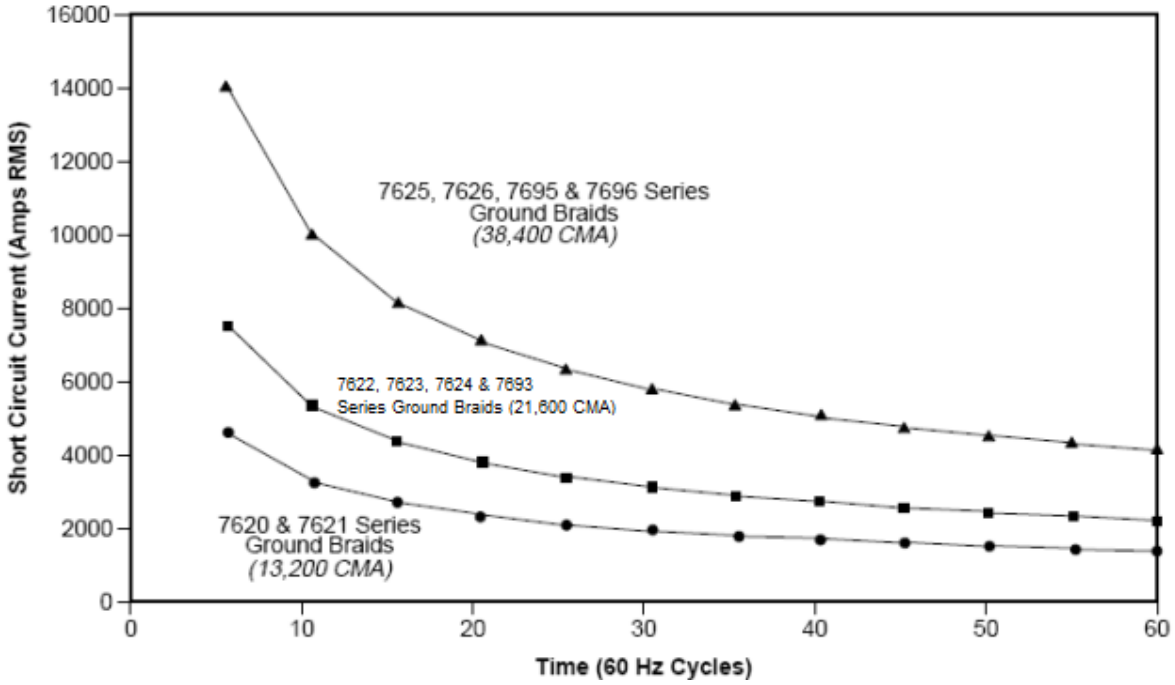
Electrical Properties (Test Method)	Typical Value English Units (Metric)
Dielectric Strength (ASTM D149) 75 mil (1,90 mm) thickness	300 V/mil (11,8 kV/mm)

Silicone Rubber Insulator

Physical Properties (Test Method)	Typical Value English Units (Metric)
Color	Dark Gray
Tensile Strength (ASTM D412)	850 psi (5,86 N/mm^2)
Modulus @ 100% Elongation Modulus @ 300% Elongation	130 psi (0,90 N/mm^2) 400 psi (2,76 N/mm^2)
Hydrophobic Recovery (3M Test Method 406) >90° Contact Angle	5.0 hrs
Electrical Properties (Test Method)	**Typical Value English Units (Metric)**
Dielectric Constant (S.I.C.) (ASTM D150) 60 Hz @ 1000 V; 73°F (23°C), 50% RH	3.6
Dissipation Factor (ASTM D150) 60 Hz @ 1000 V; 73°F (23°C), 50% RH	0.003
Dielectric Strength (ASTM D149) 75 mil (1,90 mm) thickness	500 V/mil (19,68 kV/mm)
Track Resistance (ASTM 2303) 3.5 kV	5.0 hrs.

Typical Properties, *continued,*
Ground Braid

Rated Ground Fault Current Limit



Common Conductor Size Chart

Cross Sectional Area		
Size	CMA	mm^2
10 AWG	10,380	
	11,844	6
9 AWG	13,090	
	15,792	8
8 AWG	16,510	
	19,740	10
7 AWG	20,820	
6 AWG	26,240	
	27,627	14
	31,580	15
5 AWG	33,090	
4 AWG	41,740	
	43,413	22
	49,430	25
3 AWG	52,620	
	59,200	30
2 AWG	66,360	
	69,070	35
	74,987	38
1 AWG	83,690	

3M™ Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series

Product Specifications	The 3M Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series, must have a voltage class rating equal to or greater than the cable being terminated. The rating shall be 5, 8, 15, 25/28 or 35 kV as an IEEE Standard 48 Class 1 termination. It must have a maximum continuous operating temperature rating of 221°F (105°C), with an emergency overload rating of 284°F (140°C). The termination stress control shall be capacitive and constructed of a High-K stress control compound and a High-K EPDM rubber tube. The installation procedure shall not require using silicone grease. The termination insulator shall be of a non-skirted tubular design, constructed of tracking resistant silicone rubber, dark gray in color. The termination must be of a pre-stretched cold shrink design, installed without the application of a heat source. The termination kit shall include a one-piece, non-skirted, silicone rubber termination with solderless mechanical ground assembly, and shall accommodate Tape (ribbon), Wire, or UniShield® Shielded cables. The Class 1 termination kits shall be used with listed copper or aluminum compression lugs or Shearbolt lugs.
Engineering/ Architectural Specifications	Terminating of all 5, 8, 15, 25/28 and 35 kV shielded power cables, indoors and in weather-protected equipment, shall be performed in accordance with instructions included in the 3M Cold Shrink QT-III Silicone Rubber Termination Kits, 7620-T and 7690-T Series. This shall include all weather-protected areas for Tape Shield, Wire Shield and UniShield® cables. The termination kits shall be used in conjunction with 3M Scotchlok™ Copper Compression Lugs 30000 and 31000 Series, 3M Scotchlok™ Copper/Aluminum Compression Lugs 40000 Series, 3M Stem Connectors SC Series or 3M Mechanical Shearbolt Lugs QL2 Series: Two-Hole

Performance Tests

Typical Results, IEEE Standard 48 Short-Term Test Sequence

Insulation Class Test	5 kV		8 kV		15 kV		25/28 kV		35 kV	
	Require-ments	Results	Require-ments	Results	Require-ments	Results	Require-ments	Results	Require-ments	Results
Partial Discharge Extinction voltage @ 3 pC	4.5 kV	Passed	7.5 kV	Passed	13 kV	Passed	21.5 kV	Passed	30 kV	Passed
Power Frequency Voltage 1 min. Dry Withstand	25 kV	Passed	35 kV	Passed	50 kV	Passed	65 kV	Passed	90 kV	Passed
Power Frequency Voltage 6 hr. Dry Withstand	15 kV	Passed	25 kV	Passed	36 kV	Passed	55 kV	Passed	75 kV	Passed
Direct Voltage 15 min. Dry Withstand	50 kV	Passed	65 kV	Passed	75 kV	Passed	105 kV	Passed	140 kV	Passed
Lightning Impulse Voltage Withstand (BIL)	75 kV	Passed	95 kV	Passed	110 kV	Passed	150 kV	Passed	150 kV	Passed
Partial Discharge Extinction Voltage @ 3 pC	4.5 kV	Passed	7.5 kV	Passed	13 kV	Passed	21.5 kV	Passed	30 kV	Passed

Typical Results, IEEE Standard 48 Long-Term Test Sequence

Insulation Class Test	5 kV		8 kV		15 kV		25/28 kV		35 kV	
	Require-ments	Results	Require-ments	Results	Require-ments	Results	Require-ments	Results	Require-ments	Results
Partial Discharge Extinction voltage @ 3 pC	4.5 kV	Passed	7.5 kV	Passed	13 kV	Passed	21.5 kV	Passed	30 kV	Passed
Cyclic Aging (30 days, 130°C cond. temp.) Power frequency Voltage Withstand	8.5 kV	Passed	15 kV	Passed	26 kV	Passed	43 kV	Passed	60 kV	Passed
Partial Discharge Extinction Voltage @ 3 pC	4.5 kV	Passed	7.5 kV	Passed	13 kV	Passed	21.5 kV	Passed	30 kV	Passed
Lightning Impulse Voltage Withstand (BIL)	75 kV	Passed	95 kV	Passed	110 kV	Passed	150 kV	Passed	150 kV	Passed

Partial Discharge (Corona Tests)

The purpose of corona testing is to determine whether all properly installed terminations operate corona-free at a minimum of 150% of their operating voltage. For this test, the applied test voltage is gradually increased until high frequency discharges appear on the test set's oscilloscope display. The voltage at which these discharges reach a magnitude of 3 pico-coulombs is recorded as the corona starting voltage (CSV). The applied voltage is then lowered until the discharge level drops below 3 pC, and this is recorded as the corona extinction voltage (CEV).

Performance Tests, *continued*

Power Frequency (AC) Withstand Tests

All 3M Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series, meet the IEEE Standard 48 requirements for a Class 1 termination. As the terminations are specified for indoor (weather-protected) applications, the 60 Hz ten-second wet withstand test does not apply.

Lightning Impulse Tests

For these tests, a 1.2 x 50 microsecond voltage wave is applied to the termination's lug. The testing consists of both positive and negative polarity surges per IEEE Standard 48 BIL requirements. The 3M Cold Shrink QT-III Silicone Rubber Termination Kits, 7620-T and 7690-T Series, exceed these BIL requirements.

Sealing Tests

Termination top and bottom seals are tested per IEEE Standard 48 requirements. The termination is submerged in water, current cycled 8 hours on and 16 hours off for 10 cycles. The termination is then removed and AC Withstand tested.

Installation Techniques

⚠ Caution
Working around energized high-voltage systems may cause serious injury or death. Installation should be performed by personnel familiar with good safety practice in handling electrical equipment.De-energize and ground all electrical systems before installing product.

Detailed instructions are included in each kit to provide the installer with all information required to properly install the appropriately sized 3M Cold Shrink QT-III Silicone Rubber Termination Kits, 7620-T and 7690-T Series terminations. A brief summary of the installation steps for Tape Shield cable is outlined as follows:

1. Prepare cable according to standard procedure.

2. Apply bottom mastic seal (*Figure 2*).

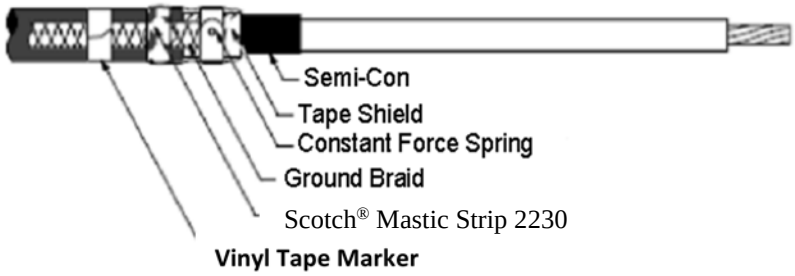
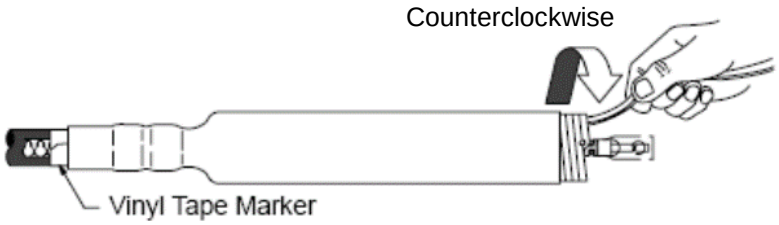


Figure 2

3. Install lug using a listed crimping tool and die.

4. Install termination onto cable and unwind core, allowing termination to shrink into place *(Figure 3)*.



NOTE: The material being removed at this step is mixed polymers and can be recycled with other waste.

Figure 3

Shelf Life & Storage	As provided in the expanded state, the 3M Cold Shrink QT-III Silicone Rubber Indoor Tubular Termination Kits, 7620-T and 7690-T Series, have a 3 year shelf life from date of manufacture when stored in a humidity controlled storage (50°F/10°C to 80°F/27°C and <75% relative humidity).
Availability	Please contact your local distributor; available from 3M.com/electrical; Select your Market (Electrical Utility Products, Electrical Construction and Industrial Products or Electrical OEM Materials), then select Where to Buy (Find a Distributor) or call 1.800.245.3573.

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