

# 3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series 5, 8, 15, 25/28 and 35 kV

Data Sheet

October 2016

## Product Description

3M Cold Shrink QT-III Silicone Rubber Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series, contain one-piece, skirted, silicone rubber terminations, and two-piece, Inverted Skirted, silicone rubber terminations, qualified as IEEE Standard 48 Class 1 for outdoor weather-exposed applications. The one-piece termination assemblies consist of a skirted insulator, high-dielectric constant (High-K) stress control tube\*, conformable High-K stress controlling compound and built-in environmental top sealing compound. The two-piece inverted skirted termination assemblies consist of a non-skirted (tubular) insulator, high-dielectric constant (High-K) stress control tube, conformable High-K stress controlling compound, built-in environmental top sealing compound and a separate skirted assembly. The insulators and separate skirted assemblies are made of a dark gray silicone rubber with excellent tracking resistance and hydrophobic properties.

**\*7620-S 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 cables rated 5 through 35 kV, with Tape Shield, Wire Shield and UniShield® constructions.

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## Kit Contents

- 3 - High-K, Tracking Resistant, Silicone Rubber Skirted Terminations
- 3 - Constant Force Springs
- 3 - Pre-formed Ground Braids
- 3 - 3M EMI Copper Foil Shielding Tape 1181 Strips, 1/2" x 10"
- 3 Tracking Resistant Silicone Rubber Skirt Assemblies (Inverted Skirted kits only)
- 6 - Strips Scotch® Mastic Strip 2230
- 1 - 3M Cleaning Cable Preparation Kit CC-2
- 1 - Instruction Sheet

NOTE: The listed quantities apply to the majority of 3M QT-III termination kits 7620-S, 7680-S and 7690-S Series. There are some special kit configurations in which they may contain only 1 each of the first four listed items and 2 each of the fifth listed item.

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# 3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series

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## Features

- Conforms to the IEEE Standard 48 Class 1 requirements for 5, 8, 15, 25/28 and 35 kV terminations
  - One-piece, and two-piece inverted skirted, versatile designs, allowing quick installation and accommodating a wide range of cable sizes
  - Cold Shrink delivery system for 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 all common solid dielectric insulations, such as polyethylene (PE), cross-linked polyethylene (XLPE) and ethylene propylene rubber (EPR)
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# 3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series

## Applications

3M Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series are designed for:

- 5, 8, 15, 25/28 and 35 kV classes
- Tape Shield, Wire Shield and UniShield® cables
- Solid dielectric insulations, such as polyethylene, XLPE and EPR
- Protected and weather-exposed contaminated locations
- Free-hanging or bracket-mounting arrangements
- Upright or inverted installation arrangements available
- Inverted termination kits are available in limited versions, but cover 5 kV to 35 kV classes
- These terminations can be field tested using normal cable testing procedures (reference: ANSI/IEEE Standard 400 "Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems." Refer to most recent version.)

The amount of airborne contamination determines the operating environment. Operating environments are described as areas having varying degrees of airborne contaminant or pollution severity that may, or may not, affect the long-term performance of terminations. These operating environments are defined as light, medium, heavy and extremely heavy variations according to pollution severity. The appropriate termination selection depends on the system voltage and operating environment. (See following tables)

## Stress Control

3M Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S 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 below illustrates an actual computerized stress plot of the 3M Cold Shrink QT-III Silicone Rubber Termination.

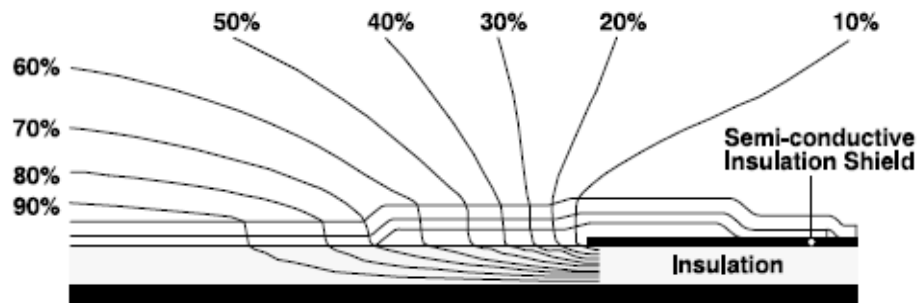


Figure 1

# 3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series

## Pollution Severity Level Guide

Light	Heavy
<ul style="list-style-type: none"> <li>Areas without industry and with low-density housing</li> <li>Areas subjected to frequent winds and/or rainfall with low-density industry and housing</li> <li>Agricultural areas *</li> <li>Mountainous areas</li> </ul> <p>All of these regions should be situated at least 7 miles from the coast and should not be exposed to coastal winds.**</p>	<ul style="list-style-type: none"> <li>High-density industrial areas and some urban areas with high-density housing, especially those with infrequent rainfall</li> <li>Areas subjected to a moderate concentration of conductive dust, particularly deposits from industrial smoke</li> <li>Areas generally close to the coast and exposed to coastal spray or to strong winds carrying sand and salt, and subjected to regular condensation</li> </ul>
Medium	Extremely Heavy
<ul style="list-style-type: none"> <li>Non-polluting industrial areas subject to infrequent rainfall and with average-density housing</li> <li>Areas subject to frequent winds and/or rainfall with high-density industry and housing</li> <li>Areas exposed to wind from the coast, but generally over two miles from the coast</li> </ul>	<ul style="list-style-type: none"> <li>Usually very limited areas having extremely heavy pollutants from industrial sites, especially those located near oceans and subjected to prevailing winds from the sea</li> <li>Very small isolated areas where terminations are located immediately adjacent to a pollutant source, especially downwind (cement plants, paper mills, etc.)</li> </ul>

\* Use of fertilizers by spraying, or the burning of crop residues, can lead to a higher pollution level due to dispersal by wind.

\*\*Distances from coast depend on the topography of the coastal area and on the extreme wind conditions.

## Recommended Application Guide

3M Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kit	System Voltage	Operating Environment			
		Light	Medium	Heavy	Extremely Heavy
(2 skirt) 7620-S-2, 7621-S-2	5 & 8 kV	✓	✓	✓	
(2 Skirt) 7622-S-2, 7622-S-2 (L)**, 7622-S-INV-2, 7622-S-INV-2 (L)**	15 kV	✓	✓	✓	
(4 Skirt) 7692-S-4 - 7696-S-4, 7692-S-4 (L)**, 7695-S-4 (L)**, 7693-S-INV-4, 7695-S-INV-4, 7696-S-INV-4, 7695-S-INV-4 (L)**	15 kV	✓	✓	✓	✓
(8 Skirt) 7683-S-8 - 7686-S-8, 7685-S-8 (L)**	15 kV	✓	✓	✓	✓
(4 Skirt) 7692-S-4 - 7696-S-4, 7695-S-4 (L)**, 7693-S-INV-4, 7695-S-INV-4, 7695-S-INV-4 (L)**, 7696-S-INV-4	25/28 kV	✓	✓	✓	
(8 Skirt) 7683-S-8 - 7686-S-8, 7685-S-8 (L)**	25/28 kV	✓	✓	✓	✓
(4 Skirt) 7693-S-INV-4, 7695-S-INV-4, 7696-S-INV-4	35 kV	✓	✓	✓	
(8 Skirt) 7683-S-8 - 7686-S-8	35 kV	✓	✓	✓	*
(12 Skirt) 7685-S-12 - 7686-S-12	35 kV	✓	✓	✓	✓

Recommended operation environments are marked with a check ( ✓ )

\*Consult 3M sales representative

\*\* The designated (L) version terminations are the same as the non-(L) versions of the above specified termination kits, except that they are on a larger core to accommodate and properly fit specific 3M Mechanical Shearbolt Lugs QL2 Series: Two-Hole and the Insulation O.D. range is slightly different than the non-(L) versions (See Termination Selection Table on Pages 9 and 10).

**Environmental Performance**

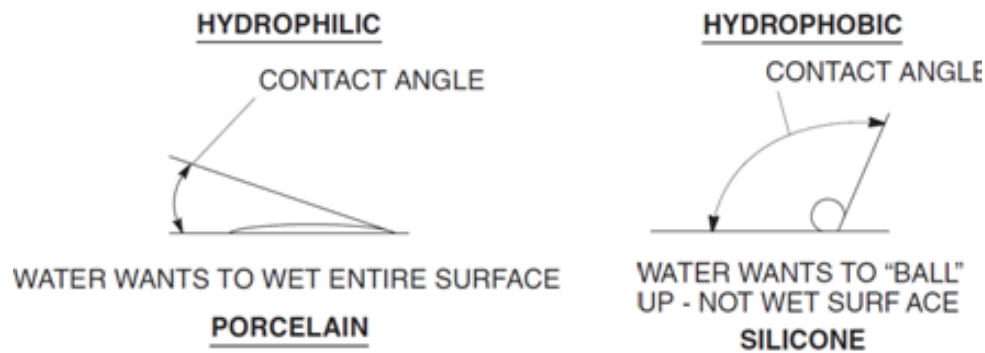
**Material Characteristics**

*Hydrophobicity*

When airborne contaminants are deposited on a termination surface, destructive leakage currents can initiate when the surface becomes wet. Fog and drizzle are normally considered to be worse than rain as these two forms of precipitation can combine with accumulated surface contaminants to reduce surface resistivity making the surface conductive to varying degrees, promoting leakage current formation. Rain tends to wash the pollutants off the termination surface.

The inherent hydrophobic nature of the silicone rubber compound used to make 3M Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits 7620-S, 7680-S and 7690-S Series components tends to reject moisture accumulation, and thereby, reduces the probability for discharge-initiated material erosion and tracking.

On occasion severe environmental conditions that are sustained for long time periods can cause any polymeric surface to lose its hydrophobicity. Because of this, EPD polymers and others tend to lose their hydrophobic nature over time. Porcelain surfaces become increasingly hydrophilic with time, which can result in premature failure or flashover. Silicone surfaces can regenerate their hydrophobic character. The silicone insulator surface will re-establish its hydrophobic surface within 24 hours. This unique ability is a major factor for ensuring a long service life.



*Ozone, Heat and UV Resistance*

One of the most outstanding physical characteristics of silicone rubber is its retention of desirable properties over the very wide temperature range of -150°F (-100°C) to 600°F (315°C). While there are applications that take advantage of these temperature extremes, a more attractive feature might be that of its extremely long life expectancy at moderate operating temperatures.

The silicone polymer molecular backbone, silicon-oxygen linkage, provides the same strong -Si-O-Si- type bond occurring in quartz, sand and glass, which accounts for the outstanding temperature properties of silicones and their resistance to oxidation by ozone, corona and weathering. Polymer chains from organic rubber materials often have double carbon bond molecular backbones, which are quickly cleaved by ozone, ultraviolet light, heat or other influences found in the operating environment.

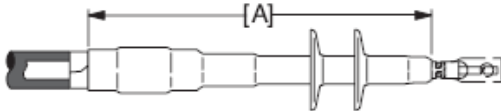
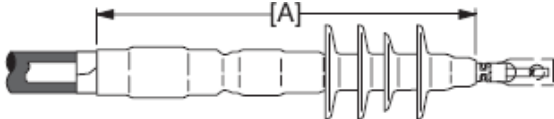
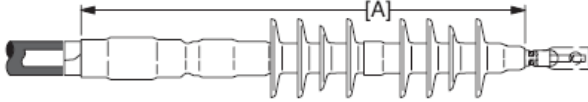
# 3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series

## Typical Properties

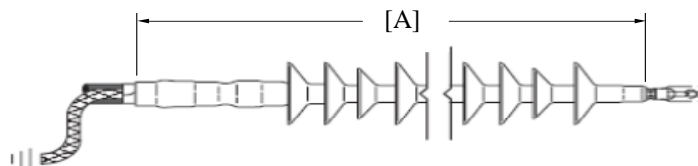
Not for specifications. Values are typical, not to be considered minimum or maximum. Properties measured at room temperature 73°F (23°C) unless otherwise stated.

3M Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series can be used on cables with a rated maximum operating temperature of 221°F (105°C) and an overload rating of 284°F (140°C). Terminations constructed from these kits meet the requirements of IEEE Standard 48, "IEEE Standard Test Procedures and Requirements for High-Voltage Alternating-Current Cable Terminations" and are designated Class 1 for outdoor weather-exposed locations. The current rating of these terminations meets or exceeds the current rating of the cables on which they are installed.

## Typical Dimensions

			
Kit Number	Dimension [A] (Max.)	Wet Creepage Distance (Max.)	Arcing Distance (Max.)
7620-S-2	10.5" (267 mm)	14.0" (356 mm)	10.5" (267 mm)
7621-S-2	10.5" (267 mm)	14.0" (356 mm)	10.5" (267 mm)
7622-S-2	9.8" (249 mm)	13.3" (338 mm)	9.8" (249 mm)
7622-S-2 (L)	9.8" (249 mm)	13.3" (338 mm)	9.8" (249 mm)
			
Kit Number	Dimension [A] (Max.)	Wet Creepage Distance (Max.)	Arcing Distance (Max.)
7692-S-4	12.25" (311 mm)	18.5" (470 mm)	12.25" (311 mm)
7692-S-4 (L)	12.25" (311 mm)	18.5" (470 mm)	12.25" (311 mm)
7693-S-4	12.25" (311 mm)	18.5" (470 mm)	12.25" (311 mm)
7694-S-4	12.25" (311 mm)	18.5" (470 mm)	12.25" (311 mm)
7695-S-4	12.25" (311 mm)	18.5" (470 mm)	12.25" (311 mm)
7695-S-4 (L)	12.25" (311 mm)	18.5" (470 mm)	12.25" (311 mm)
7696-S-4	13.25" (337 mm)	19.5" (495 mm)	13.25" (337 mm)
			
Kit Number	Dimension [A] (Max.)	Wet Creepage Distance (Max.)	Arcing Distance (Max.)
7683-S-8	20.50" (521 mm)	33.00" (838 mm)	20.50" (521 mm)
7684-S-8	20.50" (521 mm)	33.00" (838 mm)	20.50" (521 mm)
7685-S-8	20.50" (521 mm)	33.00" (838 mm)	20.50" (521 mm)
7685-S-8 (L)	20.50" (521 mm)	33.00" (838 mm)	20.50" (521 mm)
7686-S-8	21.50" (546 mm)	34.00" (864 mm)	21.50" (546 mm)

3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series



Kit Number	Dimension [A] (Max.)	Wet Creepage Distance (Max.)	Arcing Distance (Max.)
7685-S-12	28.75" (730 mm)	45.5" (1156 mm)	28.75" (730 mm)
7686-S-12	29.75" (756 mm)	46.5" (1181 mm)	29.75" (756 mm)

Kit Number	Dimension [A] (Max.)	Wet Creepage Distance (Max.)	Arcing Distance (Max.)
7622-S-INV-2	12.00" (305 mm)	19.00" (483 mm)	12.00" (305 mm)
7622-S-INV-2(L)	12.00" (305 mm)	19.00" (483 mm)	12.00" (305 mm)
7693-S-INV-4	16.00" (406 mm)	23.5" (597 mm)	16.00" (406 mm)
7695-S-INV-4	16.00" (406 mm)	23.5" (597 mm)	16.00" (406 mm)
7695-S-INV-4(L)	16.00" (406 mm)	23.5" (597 mm)	16.00" (406 mm)
7696-S-INV-4	16.00" (406 mm)	24.5" (622 mm)	16.00" (406 mm)

**High-K Stress Control Tube**

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

**High-K Stress Controlling Compound**

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

3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits,  
7620-S, 7680-S and 7690-S Series

Typical Properties  
(continued)

**Environmental Sealing Compound**

Electrical Properties	Typical Value English units (metric)
<b>Dielectric Strength (ASTM D149)</b> 75 mil (1,90 mm) thickness	300 V/mil (11,8 kV/mm)

**Silicone Rubber Insulator**

Typical Properties  
(continued)

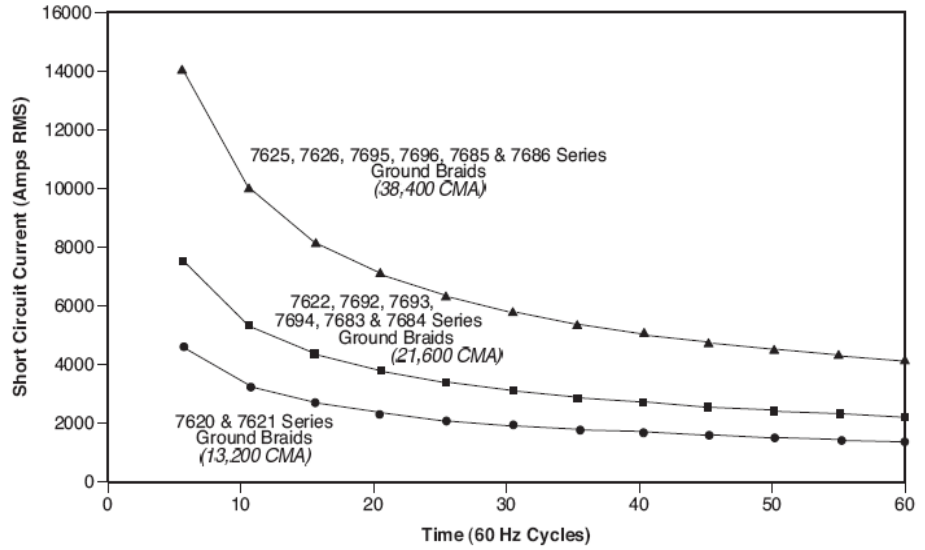
Physical Properties (Test Method)	Typical Value English units (metric)
<b>Color</b>	Dark Gray
<b>Tensile Strength (ASTM D412)</b> Modulus @ 100% Elongation Modulus @ 300% Elongation	850 psi (5,86N/mm <sup>2</sup> ) 130 psi (0,90N/mm <sup>2</sup> ) 400 psi (2,76N/mm <sup>2</sup> )
<b>Hydrophobic Recovery (3M Test Method No. 406)</b> >90° Contact Angle	5.0 hrs
Electrical Properties (Test Method)	Typical Value English units (metric)
<b>Dielectric Constant (S.I.C.) (ASTM D150)</b> 60 Hz @ 1000 V; 73°F (23°C), 50% RH	3.6
<b>Dissipation Factor (ASTM D150)</b> 60 Hz @ 1000 V; 73°F (23°C), 50% RH	0.003
<b>Dielectric Strength (ASTM D149)</b> 75 mil (1,90 mm) thickness	500 V/mil (19,68 kV/mm)
<b>Track Resistance (ASTM 2303)</b> 3.5 kV	5.0 hrs.



# 3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series

## Typical Properties Ground Braid

## Rated Ground Fault Current Limit



## Common Conductor Size Chart

Cross Sectional Area		
Size	CMA	mm <sup>2</sup>
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 Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series

## 3M Cold Shrink QT-III Silicone Rubber Skirted Termination Selection Table

7620-S, 7680-S and 7690-S Series

Kit Number	Cable Insulation O.D. Range	Conductor Size Range (AWG and kcmil)				
		5 kV 100% and 133 %	8 kV 100% and 133%	15 kV 100% and 133%	25/28 kV 100% and 133%	35 kV 100% and 133%
7620-S-2	0.32 - 0.59" (8,1 - 15,0 mm)	8 - 4	8 - 6	-	-	-
7621-S-2	0.44 - 0.89" (11,2 - 22,6 mm)	2 - 3/0	4 - 2/0	-	-	-
7622-S-2	0.64 - 1.08" (16,3 - 27,4 mm)	4/0 - 400	3/0 - 300	2 - 4/0 (35 - 120 mm <sup>2</sup> )	-	-
7622-S-2 (L)*	0.69 - 1.22" (17,5 - 31,0 mm)	-	-	1/0 - 4/0 (60 - 120 mm <sup>2</sup> )	-	-
7692-S-4	.064 - 1.08 (16,3 - 27,4 mm)	4/0 - 400	3/0 - 300	2 - 4/0 (35 - 120 mm <sup>2</sup> )	2 - 1/0 (35 - 50 mm <sup>2</sup> )	-
7692-S-4 (L)*	0.69 - 1.22 (17,5 - 31,0 mm)	-	-	1/0 - 4/0 (60 - 120 mm <sup>2</sup> )	-	-
7693-S-4	0.72 - 1.29" (18,3 - 32,8 mm)	300 - 500	250 - 500	2/0 - 300 (70 - 150 mm <sup>2</sup> )	2 - 4/0 (35 - 120 mm <sup>2</sup> )	-
7694-S-4	0.83 - 1.53" (21,1 - 38,9 mm)	500 - 750	350 - 700	4/0 - 500 (120 - 240 mm <sup>2</sup> )	2/0 - 250 (70 - 150 mm <sup>2</sup> )	-
7695-S-4	1.05 - 1.80" (26,7 - 45,7 mm)	700 - 1500	600 - 1250	500 - 1000 (240 - 500 mm <sup>2</sup> )	250 - 800 (150 - 400 mm <sup>2</sup> )	-
7695-S-4 (L)*	1.15 - 1.98" (29,2 - 50,3 mm)	-	-	750 - 1000 (400 - 500 mm <sup>2</sup> )	500 - 750 (240 - 325 mm <sup>2</sup> )	-
7696-S-4	1.53 - 2.32" (38,9 - 58,9 mm)	1750 - 2000	1500 - 2000	1250 - 2000 (625 - 1000 mm <sup>2</sup> )	900 - 1750 (500 - 800 mm <sup>2</sup> )	-
7683-S-8	0.72 - 1.29" (18,3 - 32,8 mm)	300 - 500	250 - 500	2/0 - 300 (70 - 150 mm <sup>2</sup> )	2 - 4/0 (35 - 120 mm <sup>2</sup> )	2 - 2/0 (35 - 70 mm <sup>2</sup> )
7684-S-8	0.83 - 1.53" (21,1 - 38,9 mm)	500 - 750	350 - 700	4/0 - 500 (120 - 240 mm <sup>2</sup> )	2/0 - 250 (70 - 150 mm <sup>2</sup> )	2 - 4/0 (35 - 120 mm <sup>2</sup> )
7685-S-8	1.05 - 1.80" (26,7 - 45,7 mm)	700 - 1500	600 - 1250	500 - 1000 (240 - 500 mm <sup>2</sup> )	250 - 800 (150 - 400 mm <sup>2</sup> )	3/0 - 600 (95 - 325 mm <sup>2</sup> )
7685-S-8 (L)*	1.15 - 1.98" (29,2 - 50,3 mm)	-	-	750 - 1000 (400 - 500 mm <sup>2</sup> )	500 - 750 (240 - 325 mm <sup>2</sup> )	-
7686-S-8	1.53 - 2.32" (38,9 - 58,9 mm)	1750 - 2000	1500 - 2000	1250 - 2000 (625 - 1000 mm <sup>2</sup> )	900 - 1750 (500 - 800 mm <sup>2</sup> )	700 - 1500 (400 - 725 mm <sup>2</sup> )
7685-S-12	1.05 - 1.80" (26,7 - 45,7 mm)	700 - 1500	600 - 1250	500 - 1000 (240 - 500 mm <sup>2</sup> )	250 - 800 (150 - 400 mm <sup>2</sup> )	3/0 - 600 (95 - 325 mm <sup>2</sup> )
7686-S-12	1.53 - 2.32" (38,9 - 58,9 mm)	1750 - 2000	1500 - 2000	1250 - 2000 (625 - 1000 mm <sup>2</sup> )	900 - 1750 (500 - 800 mm <sup>2</sup> )	700 - 1500 (400 - 725 mm <sup>2</sup> )

# 3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series

## 3M Cold Shrink QT-III Silicone Rubber Inverted Skirted Termination Selection Table

7620-S-INV and 7690-S-INV Series

Kit Number	Cable Insulation O.D. Range	Conductor Size Range (AWG and kcmil)				
		5 kV 100% and 133 %	8 kV 100% and 133%	15 kV 100% and 133%	25/28 kV 100% and 133%	35 kV 100% and 133%
7622-S-INV-2	0.64 - 1.08" (16,3 - 27,4 mm)	4/0 - 400	3/0 - 300	2 - 4/0 (35 - 120 mm <sup>2</sup> )	-	-
7622-S-INV-2(L)*	0.69 - 1.22" (17,5 - 31,0 mm)	-	-	1/0 - 4/0 (60 - 120 mm <sup>2</sup> )	-	-
7693-S-INV-4	0.72 - 1.29" (18,3 - 32,8 mm)	300 - 500	250 - 500	2/0 - 300 (70 - 150 mm <sup>2</sup> )	2 - 4/0 (35 - 120 mm <sup>2</sup> )	2 - 2/0 (35 - 70 mm <sup>2</sup> )
7695-S-INV-4	1.05 - 1.80" (26,7 - 45,7 mm)	700 - 1500	600 - 1250	350 - 1000 (185 - 500 mm <sup>2</sup> )	250 - 800 (150 - 400 mm <sup>2</sup> )	3/0 - 600 (95 - 325 mm <sup>2</sup> )
7695-S-INV-4(L)*	1.15 - 1.90" (29,2 - 48,3 mm)	-	-	750 - 1000 (400 - 500 mm <sup>2</sup> )	500 - 750 (240 - 325 mm <sup>2</sup> )	-
7696-S-INV-4	1.53 - 2.32" (38,9 - 58,9mm)	1750 - 2000	1500 - 2000	1250 - 2000 (625 - 1000 mm <sup>2</sup> )	900 -1750 (500 - 800 mm <sup>2</sup> )	700 -1500 (400 - 725 mm <sup>2</sup> )

\* Conductor Size Range values for this termination only apply when using 3M Mechanical Shearbolt Lugs QL2 Series: Two-Hole, otherwise the Conductor Size Range values for the base termination Kit Number apply.

# 3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series

## Product Specifications

The 3M Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series cable terminations 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 High-K EPDM rubber tube. The installation procedure shall not require using silicone grease.

The termination insulator shall be of a skirted 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 all materials required (except lug and vinyl tape) 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 Skirted and Inverted Skirted Termination Kits 7620-S, 7680-S and 7690-S Series. This shall include all outdoor weather-exposed areas for Tape (ribbon), Wire or UniShield® Shielded 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 / 8 kV (2 Skirt)		15/25 kV (4 Skirt)		35 kV (8 and 12 Skirt)	
	Requirements	Results	Requirements	Results	Requirements	Results
Partial Discharge Extinction voltage @ 3 pC	7.5 kV	Passed	13 / 21,5 kV	Passed	30 kV	Passed
Power Frequency Voltage 1 min. Dry Withstand	35 kV	Passed	50 / 65 kV	Passed	90 kV	Passed
Power Frequency Voltage 10 sec, Wet Withstand	30 kV	Passed	45 / 60 kV	Passed	80 kV	Passed
Power Frequency Voltage 6 hr. Dry Withstand	25 kV	Passed	35 / 60 kV	Passed	76 kV	Passed
Direct Voltage 15 min. Dry Withstand	65 kV	Passed	75 / 105 kV	Passed	140 kV	Passed
Lightning Impulse Voltage Withstand (BIL)	95 kV	Passed	110 / 150 kV	Passed	200 kV	Passed
Partial Discharge Extinction Voltage @ 3 pC	7.5 kV	Passed	13 / 21.5 kV	Passed	30 kV	Passed

# 3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series

## Performance Tests (continued)

### Typical Results, IEEE Standard 48 Long-Term Test Sequence

Insulation Class Test	5 / 8 kV (2 Skirt)		15/25 kV (4 Skirt)		35 kV (8 and 12 Skirt)	
	Requirements	Results	Requirements	Results	Requirements	Results
Partial Discharge Extinction voltage @ 3 pC	7.5 kV	Passed	13 / 21.5 kV	Passed	30 kV	Passed
Cycling Aging 30 days, 130°C cond. temp Power Frequency Voltage Withstand	15 kV	Passed	26 / 43 kV	Passed	60 kV	Passed
Partial Discharge Extinction Voltage @ 3 pC	7.5 kV	Passed	13 / 21.5 kV	Passed	30 kV	Passed
Lightning Impulse Voltage Withstand (BIL)	95 kV	Passed	110 / 150 kV	Passed	200 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 the test, an applied test voltage is gradually increased until discharges appear on the test set oscilloscope display. The voltage at which these discharges reach a magnitude of 3 picocoulombs is recorded as the corona starting voltage (CSV). The applied voltage is then lowered until the discharge level drops below 3 picocoulombs, and this is recorded as the corona extinction voltage (CEV).

### Power Frequency (AC) Withstand Tests

All 3M Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series meet, or exceed, the IEEE Standard 48 requirements for a Class 1 termination.

### 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 Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series terminations kits exceed these BIL requirements.

### Environmental 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.

# 3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series

## Installation Techniques

### ⚠ Caution

Working around energized electrical 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 Skirted and Inverted Skirted Termination Kits. 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).

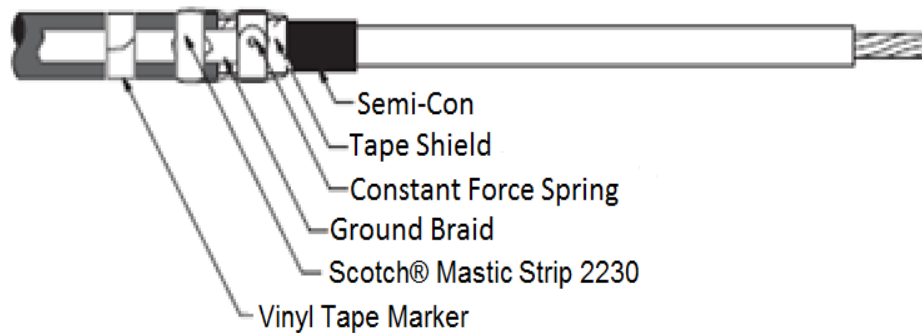
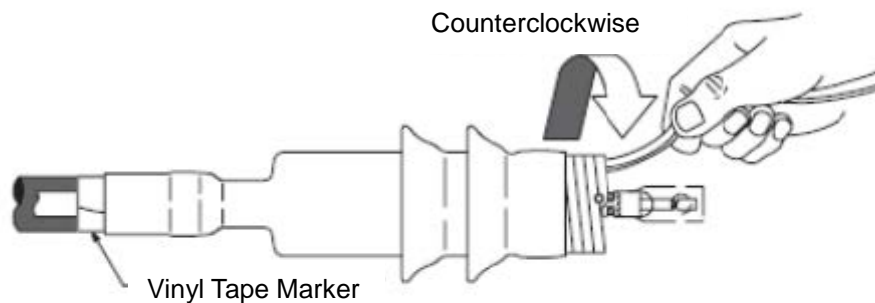


Figure 2

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  waste.

Figure 3

**Maintenance**

It is good practice to incorporate a general inspection/cleaning of 3M Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits during normal scheduled or maintenance inspections. Once the area has been de-energized, the terminations can be inspected, and if need be, cleaned. Some recommendations for surface cleaning 3M Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Terminations are as follows:

Use a can of compressed 'air' in order to blast off dust and miscellaneous airborne contaminants on the surface of the termination body. If needed, wipe the surface of the termination with a cable cleaning solvent, such as 3M Cable Cleaning System CC Series solvent, and allow it to dry before re-energizing the installation.

Mix a mild soap and water solution (deionized water is recommended, if available) in a hand sprayer, or spray bottle, and spray down the surface of the termination. Wipe dry, or allow to air dry, before re-energizing.

If tan discoloration between skirts is observed on the surface of the termination, wipe with a cable cleaning solvent. The discoloration itself does not pose any detrimental effect to the installation, and may not disappear entirely, but it will lighten up to some degree. This discoloration is a typical result of the outgassing effect of EPR cable and does not interfere with the performance of the termination in any capacity.

Do not abrade the surface of the termination in any way. Do not use high pressure cleaning (this can tear, or split, the termination), high pressure water with corn cobs, sandpaper or other abrasive products. This will damage the termination surface and reduce tracking and arcing resistance.

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# 3M™ Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S Series

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## Shelf Life & Storage

As provided, in the expanded state, the 3M Cold Shrink QT-III Silicone Rubber Skirted and Inverted Skirted Termination Kits, 7620-S, 7680-S and 7690-S 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).

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## 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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