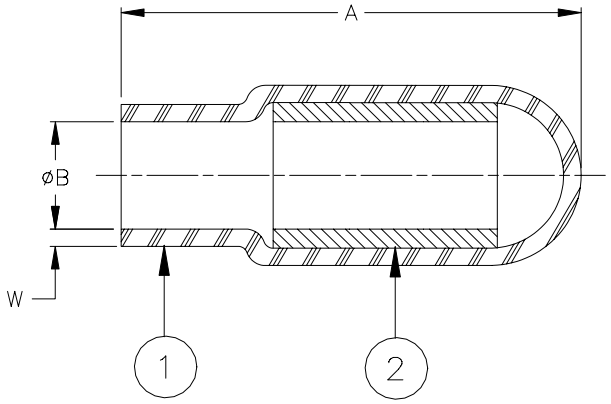
SPECIFICATION CONTROL DRAWING



Product Rev		Product Dimensions					Maximum Weight
		As Received			After Free Recovery		
Product Name		A±2.54 (A±0.100)	øB min	W min	øB max	W min	Pounds/mpc
D-300-01	E	25.40 (1.000)	4.45 (0.175)	0.25 (0.010)	2.03 (0.080)	0.76 (0.030)	1.15
D-300-02	E	27.90 (1.100)	6.35 (0.250)	0.38 (0.015)	3.05 (0.120)	1.02 (0.040)	2.55
D-300-03	E	33.02 (1.300)	9.14 (0.360)	0.38 (0.015)	4.57 (0.180)	1.27 (0.050)	4.50

MATERIALS

1. MOLDED CAP: Heat-shrinkable, cross-linked, flame-retarded modified polyolefin.
2. MELTABLE RING: Modified thermoplastic.

APPLICATION

1. These parts are designed to meet the requirements as shown in the Requirements Section when tested as listed.
2. Parts to be assembled as outlined herein.
3. “B” recovered is the maximum inside diameter of the heat-shrinkable cap.
4. “W” is the wall thickness of the heat-shrinkable cap only, and is measured along the vertical wall.
5. “A” is the average length of the cap and is equal to (A min + A max)/2.

1.0 SCOPE

This document covers the requirements and test procedures applicable to heat shrinkable, stub-splice encapsulation cap (caps) and the molded component thereof.

2.0 APPLICABLE DOCUMENTS

The specifications and standards referenced herein shall form part of this specification to the extent specified.

3.0 REQUIREMENTS

3.1 Material: The splice encapsulation caps shall be fabricated from the materials specified on sheet 1 of this specification. The materials shall be homogenous and essentially free from flaws, defects, pinholes, seams, cracks and inclusions.

3.1.1 Color: The caps shall be black.

3.1.2 Properties of Molded Component: The molded component and the material from which it is fabricated shall meet the requirements in Table 1.

3.1.3 Properties of Finished Caps: The finished caps shall meet the requirements of Table 2.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 Classification of Tests:

4.1.1 Qualification of Tests: Qualification testing shall consist of all test listed in this specification.

4.1.2 Acceptance tests: Acceptance tests shall consist of those tests applicable to Qualification Test Groups A and F.

4.2 Sampling Instructions:

4.2.1 Qualification Test Samples: Qualification test samples shall consist of six molded slabs, 6 x 6 x 0.075± .010 inches and 62 caps of the size for which qualification is desired. The molded slabs shall be fabricated from the same lot of material and shall be subjected to the same degree of cross-linking as the molded components.

4.2.2 Acceptance Test Samples: Acceptance test samples shall consist of finished caps selected at random in accordance with ANSI/ASQC Z1.4, Inspection Level S-2, AQL 6.5%. A lot of finished caps shall consist of all caps fabricated from the same lot of molded components, from the same production run, and offered for inspection at the same time.

4.3 Test Procedures – Molded Slabs

4.3.1 Tensile Strength And Ultimate Elongation: Three specimens cut from a molded slab, using die D of ASTM D 412, shall be tested for tensile strength and ultimate elongation in accordance with ASTM D 412.

4.3.2 Low-Temperature Flexibility: A 6- x ¼ inch specimen cut from a molded slab shall be mounted in a loop position between movable, parallel, sets of jaws 2 ½ inches apart, mounted on a test fixture. Each end of the specimen shall extend at least ¾ inch into a set of jaws and shall be firmly fastened. The specimen and the test fixture shall be conditioned for four hours at –55 ± 2°C (-67 ± 4°F). While at this temperature, the sets of jaws shall be moved rapidly from a 2 ½ inch to a 1 inch separation.

4.3.3 Heat Shock: Three 6 x ¼ inch specimens, cut from a molded slab, shall be conditioned for four hours in a 225 ± 5°C (437 ± 9°F) mechanical-convection oven in which air passes the specimens at a velocity of 100 to 200 feet per minute. After conditioning, the specimens shall be removed from the oven, cooled to room temperature, and visually examined for evidence of dripping, flowing, or cracking.

4.3.4 Heat Aging:

4.3.4.1 Procedure A: Three specimens, prepared and measured in accordance with 4.3.1, shall be conditioned for 168 hours in a 175 ± 5°C (347 ±9°F) mechanical-convection oven in which air passes the specimens at a velocity of 100 to 200 feet per minute. After conditioning, the specimens shall be removed from the oven, cooled to room temperature, and tested for tensile strength and ultimate elongation in accordance with 4.3.1.

4.3.4.2. Procedure B: Three specimens, prepared and measured in accordance with 4.3.1, shall be conditioned for 1000 hours in a 150 ± 3°C (302 ± 5°F) mechanical-convection oven in which air passes the specimens at a velocity of 100 to 200 feet per minute. After conditioning, the specimens shall be removed from the oven, cooled to room temperature, and tested for tensile strength and ultimate elongation in accordance with 4.3.1.

4.2.1 Solvent Resistance: Three specimens, prepared and measured in accordance with 4.3.1, shall be completely immersed in each of the solvents listed in the applicable section of Table 1 for 24 hours at 25 ± 3°C (77 ± 5°F). The volume of the fluid shall be not less than 20 times that of the specimens. After conditioning, the specimens shall be lightly wiped, and then air-dried for 30 to 60 minutes at room temperature. The specimens shall then be tested for tensile strength and ultimate elongation in accordance with 4.3.1.

4.3 Test Procedures – Finished Caps

4.3.1 Test Assembles: The test assembles shall consist of fifty-five crimped stub splices made in wire confirming to MIL-W-81044/12 or MIL- 16878/4. Leads shall be 10 ± 1 inches long, and shall be of the gauge listed below for the cap for which qualification is desired. Caps shall be installed in accordance with Thermofit Assembly Procedure (see sheet 6).

Cap Size	Number of Wires/Splice	Wire Gauge (AWG)
D-300-01	2	18
D-300-02	2	14
D-300-03	3	12

4.2.1 Dimensions And Dimensional Recovery: Five specimens, as supplied, shall be measured for dimensions in accordance with ASTM D 876. The specimens shall then be conditioned for ten minutes in a 200 ± 5°C (392 ± 9°F) oven, quenched in water in less than 35°C (95°F) for at least 30 seconds, wiped dry, and the appropriate measurements taken.

4.2.2 Insulation Resistance: The specimen shall be immersed to within 3 inches of the lead ends in a water bath containing 5% by weight of NaCl for a minimum of 30 minutes after which time the insulation resistance shall be measured between the salt solution and the test leads. The test potential shall be 500 volts D.C. The readings shall be taken after an electrification time of one minute.

4.2.3 Dielectric Withstanding Voltage: The specimen shall be immersed to within 3 inches of the lead ends in a water bath containing 5% by weight of NaCl for a minimum of 30 minutes after which time the potential between the salt water and the test leads shall be raised from 0 to the specified voltage at a rate of 500 volts per second. This potential shall be maintained for one minute and the voltage reduced to 0.

4.2.4 Temperature Cycling: Fifteen assemblies shall be subjected to 200 cycles. Each cycle shall consist of 20 minutes at 135°C (275°F) and 5 minutes at 240°C (400°F) in mechanical-convection ovens with an air velocity of 100 to 200 feet per minute past the specimens. The specimens shall be subjected to 20 cycles per day and shall be maintained at 25 ± 5°C (77 ± 9°F) between test days. After the last cycle, the specimen shall be cooled to 25 ± 5°C (77 ± 9°F) within one hour and tested for insulation resistance (4.4.3) and dielectric withstanding voltage (4.4.4).

4.2.1 Heat Aging: Fifteen assemblies shall be conditioned for 1000 hours at 150 ± 3°C (302 ± 5°F) in a mechanical-convection oven with an air velocity of 100 to 200 feet per minute past the specimens. After conditioning, the specimen shall be cooled to 25 ± 5°C (77 ± 9°F) within one hour and tested for insulation resistance (4.4.3) and dielectric withstanding voltage (4.4.4).

4.2.1 Altitude Immersion: Fifteen assemblies shall be immersed in a water bath containing 5% by weight of NaCl and placed in a chamber. Wire ends, opposite the cap, shall be within the chamber, but not submerged. The exposed wire ends shall not be sealed. The chamber pressure shall be reduced to approximately 1 inch of mercury and maintained for 30 minutes. The chamber pressure shall then be returned to atmospheric pressure. The insulation assistance shall be measured in accordance with 4.4.3. This shall constitute one cycle. Two additional environment cycles shall be run. At the end of the third cycle, the insulation resistance (4.4.3) shall be re-measured, and the dielectric withstanding voltage test (4.4.4) shall be performed.

4.2.1 Corrosive effect: Two caps, as supplied, shall be placed in the bottoms of two clean ½ x 12 inches test tubes (one cap per tube). A third tube shall be used for control. A copper-glass mirror, about 1 x ¼ inches shall be suspended from 6 to 7 inches above the bottom of each tube by a fine copper wire attached to a cork wrapped in aluminum foil. The corks shall tightly seal the test tubes. The lower 2 inches of each tube then shall be placed in an oven or oil bath at 175 ± 3°C for 16 hours. After cooling, the mirrors shall be examined in a good light against a white background. Evidence of corrosion shall be areas of transparency larger than pinholes in a mirror. Discoloration of the copper film or reduction of its thickness shall not be considered corrosion. The mirrors shall be vacuum- deposited copper with thickness equal to 10 ± 5% transmission of normal incident light of 5000 angstroms. They shall be stored in a vacuum and shall be used for test only if no oxide film is present and the copper is not visibly damaged.

4.2.1 Flammability: Specimens shall be mounted horizontally in a draft-free chamber. A standard 1/8" Bunsen burner shall be adjusted to produce a blue flame approximately 1" high. This flame shall be applied at a distance of 1" to the closed end of the test specimen for 10 seconds. The flame shall then be removed and the specimen shall remain undisturbed until burning ceases. Failure of more than one specimen to extinguish itself with 30 seconds shall be cause for rejection.

TABLE 1

REQUIREMENTS FOR MOLDED COMPONENT

Property	Unit	Requirement	Method of Test
Tensile Strength	psi	1500 minimum	Section 4.3.1 (ASTM D 412)
Ultimate Elongation	percent	250 minimum	
Stiffness	psi	10,000 minimum 25,000 maximum	ASTM D 747
Specific Gravity		1.40 maximum	ASTM D 792

TABLE 1

REQUIREMENTS FOR MOLDED COMPONENT
(continued)

Property	Unit	Requirement	Method of Test
Hardness	Shoe D	50±10	ASTM D 2240
Low Temperature Flexibility 4 hours @ -55°C (-67°F)		No cracking	Section 4.3.2
Heat Shock 4 hours @ 225°C (437°F)		No Dripping, flowing or cracking	Section 4.3.3
Heat Aging			Section 4.3.4 Procedures A and B
Followed by test for: Tensile Strength Ultimate Elongation	 psi percent	 1200 minimum 200 minimum	 Section 4.3.1 (ASTM D 412)
Flammability		Non-burning	ASTM D 635
Fungus Resistance		Rating of 1 or less	ASTM D 876
Water Absorption 24 hours @ 25°C (77°F)	percent	0.2 maximum	ASTM D 570 Procedure A
Solvent Resistance 24 hours @ 25°C (77°F) in JP-4 Fuel Skydrol* 500 Hydraulic Fluid (MIL-H-5606) Aviation Gasoline (100/130) Water			Section 4.3.5
Followed by test for: Tensile Strength Ultimate Elongation	 psi percent	 1200 minimum 200 minimum	 Section 4.3.1 (ASTM D 412)

TABLE 2

REQUIREMENTS FOR FINISHED CAP

Test Group A – Five Caps			
Property	Unit	Requirement	Method of Test
Dimensions Dimension Recovery	Inches Inches	Sheet 1 Sheet 1	ASTM D 876 Section 4.4.2
Test Group B – Fifteen Specimens			
Property	Unit	Requirement	Method of Test
Insulation Resistance Temperature Cycling Followed by test for: Insulation Resistance Dielectric Withstanding Voltage	Megaohms Megaohms Volts	5000 minimum 5000 minimum 1500 (rms)	Section 4.4.3 Section 4.4.5 Section 4.4.3 Section 4.4.4
Test Group C – Fifteen Specimens			
Property	Unit	Requirement	Method of Test
Insulation Resistance Heat Aging Followed by test for: Insulation Resistance Dielectric Withstanding Voltage	Megaohms Megaohms Volts	5000 minimum 5000 minimum 1500 (rms)	Section 4.4.3 Section 4.4.3 Section 4.4.4
Test Group D – Fifteen Specimens			
Property	Unit	Requirement	Method of Test
Insulation Resistance Altitude Immersion Followed by test for: Insulation Resistance Dielectric Withstanding Voltage	Megaohms Megaohms Volts	5000 minimum 5000 minimum 1500 (rms)	Section 4.4.3 Section 4.4.7 Section 4.4.3 Section 4.4.4
Test Group E– Two Caps			
Property	Unit	Requirement	Method of Test
Corrosive Effect		Non-Corrosive	Section 4.4.8
Test Group F – Ten Assemblies			
Flammability		Self extinguishing within 30 seconds	Section 4.4.9

SPECIFICATION CONTROL DRAWING

Thermofit Assembly Procedure

1. Strip the wires and install crimp type connector or solder wires together. Connector should be installed so that 1/6 ± 1/32 of conductor is exposed between the connector and the wire insulation, as shown in Figure 1.
2. Choose the proper size cap from the chart below. Place splice into cap so that the connector bottoms on the rounded end of the cap.
3. Heat the assembly, using a Thermogun, Model 500A, or equivalent, equipped with a TG-12 or TG-13A reflector.
4. The average length of time required for proper heating is given in the chart. However, since the heat sink effect of various wire bundles may vary considerably, several trial specimens should be crossed-sectioned as shown in Figure 2 before proceeding with production installations. If the area between the wires is not completely filled, a longer heating cycle should be established.
5. With wire bundles of more than three wires, it is helpful to slightly deform the cap by pinching in the area above the connection at the end of the heating cycle and then returning the cap to the heat for an additional period to allow the cap to return to its cylindrical shape.

Chart 1

Part Name	Splicer Diameter		Time (sec.)	Bundle Diameter Maximum
	Minimum	Maximum		
D-300-01	2.03 (0.080)	4.91 (0.165)	30	.115
D-300-02	3.04 (0.120)	6.35 (0.250)	45	.200
D-300-03	4.57 (0.180)	8.89 (0.350)	60	.300

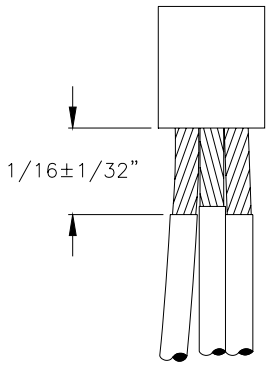


Figure 1

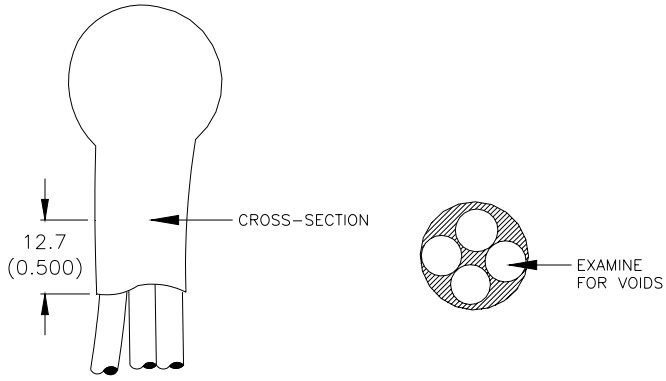


Figure 2

tyco Electronics Raychem 307 Constitution Drive Menlo Park, CA 94025, USA		Wire and Harnessing Products	TITLE : CAP, SPLICE ENCAPSULATION				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS. INCHES DIMENSIONS ARE BETWEEN BRACKETS.			DOCUMENT NO.: D-300-01/-03				
TOLERANCES: 0.00 N/A 0.0 N/A 0 N/A	ANGLES: N/A ROUGHNESS IN MICRON	Tyco Electronics reserves the right to amend this drawing at any time. Users should evaluate the suitability of the product for their application.	DCR NUMBER: D010043		REPLACES: N/A		
DRAWN BY: M. FORONDA	DATE: 15-Feb.-01	PROD. REV. SEE TABLE	DOC ISSUE: 1	SCALE: None	SIZE: A	SHEET: 7 of 7	

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