1.0 Scope

This specification covers the requirements for flexible, electrically-insulating, side-enterable repair sleeves. These C-shaped sleeves are designated D-260-C-A through D-260-C-E.

The diameter of the repair sleeves will reduce to a predetermined size when heat is applied to the sleeve in accordance with RPIP-1106. The tubing is suitable for use in wire harness systems requiring fluid resistance.

1.1 Description

RaySeal devices consist primarily of a pre-coated insulation sleeve with a high temperature adhesive. These devices are supplied in a side entry repair kit to repair damaged power feeders. The damage shall not be greater than 0.5 inch longitudinally. The temperature rating of this product is -65 to 260 °C.

1.2 Classification

RaySeal devices shall be supplied as specified on TE Customer Drawing D-260-C-X.

2.0 Applicable Documents

This specification takes precedence over documents referenced herein. Unless otherwise specified, the latest issue of referenced documents applies. The following documents form a part of this specification to the extent specified herein.

2.1 Government/military documents

MIL-PRF-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordnance
MIL-DTL-5624	Turbine Fuel, Aviation, Grades JP-5
MIL-PRF-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-PRF-23699	Lubricating Oil, Aircraft Turbine Engines, Synthetic Base
MIL-PRF-87937	Cleaning Compound, Aircraft Surface, Alkaline, Water Base
MIL-STD-202	Test Methods for Electronic Component Parts

2.2 TE Connectivity Documents

D-260-C-X	Customer Drawing, RaySeal Wire Repair Sleeve Kit
RPIP-1106	Installation Procedure for D-260-C-X Series RaySeal Repair Sleeve Kit
RT-1050/29	RAYCHEM BRAND® ADHESIVE, S-1260

2.3 Other Publications

ANSI/ASQC Z1.4	Sampling Procedures and Tables for Inspection by Attributes
NCSL-Z540.1	Calibration System Requirements
SAE-AMS1424	Deicing/Anti-Icing Fluid, Aircraft SAE Type I

(Copies of Department of Defense documents may be obtained from the Standardization Document Order Desk, 700 Robbins Ave., Building 4, Section D, Philadelphia, PA 19111-5094.)

3.0 Requirements

3.1 Materials

3.1.1 See TE CD for the outer sleeve and adhesive material and color details.

3.1.2 Adhesive properties and performance shall be in accordance with RT-1050/29.

3.2 Continuous Operating Temperature

See TE CD for the operating temperature range.

3.3 Performance Requirements

3.3.1 Visual and Dimensional Examinations

RaySeal devices shall be visually examined per 5.1.3 and the as-supplied dimensions shall be measured in accordance with the applicable TE customer drawing.

3.3.2 Insulation Resistance

When installed RaySeal devices are tested in accordance with 5.1.4, the insulation resistance shall be not less than 5000 megaohms.

3.3.3 Dielectric Withstanding Voltage. When installed RaySeal devices are tested in accordance with 5.1.5, the insulation shall withstand the 2500 Vrms, 60 Hz potential for 60 seconds with no evidence of arcing or breakdown. Leakage current shall be 2.0 milliamperes maximum.

3.3.4 Vibration. When installed RaySeal devices are subjected to 15 g peak sine vibration in accordance with 5.1.7, there shall be no evidence of cracking, breaking or loosening of the RaySeal sleeve and the sleeve shall meet the insulation resistance and dielectric withstanding voltage specified in 3.3.2 and 3.3.3.

3.3.5 Thermal Shock. When installed RaySeal devices are subjected to five thermal shock cycles between the maximum rated temperature 260 °C and minus 65 °C in accordance with 5.1.8, there shall be no evidence of damage to the repair sleeve termination, and the termination shall meet the insulation resistance and dielectric withstanding voltage requirements specified in 3.3.2 and 3.3.3. Discoloration of the RaySeal device insulation shall not be cause for rejection.

3.3.6 Heat Aging. When tested in accordance with 5.1.9, the RaySeal sleeve shall meet the subsequent performance requirements of Table III. Discoloration of the RaySeal device insulation shall not be cause for rejection.

3.3.7 Fluid Resistance. When installed RaySeal devices are exposed to any of the eleven test fluids in accordance with 5.1.10, the repair sleeve shall meet the dielectric withstanding voltage requirements specified in 3.3.3.

3.3.8 Flammability. When installed, horizontally suspended RaySeal devices are exposed to flame for 20 seconds in accordance with 5.1.11, the RaySeal insulation shall be self-extinguishing within 5 seconds after removal from flame.

3.3.9 Altitude Immersion. When installed RaySeal devices are subjected to three altitude immersion cycles between sea level and 75,000-foot altitude in accordance with

5.1.12, the insulation resistance shall be not less than 5000 megaohms and the leakage current shall be not greater than 2.0 milliamperes.

3.3.10 Copper Mirror Corrosion. When RaySeal devices are tested for 16 hours at 200 ºC in accordance with 5.1.13, copper removal shall not exceed 10 percent of the area of the mirror above the bottom .063 inch.

3.3.11 Slip Resistance Test. When installed, RaySeal devices are tested in accordance with 5.1.16, the slip resistance of the RaySeal sleeve shall not be less than the minimum specified in Table I. Breakage of wire shall not be cause for rejection.

4.0 Quality Assurance Provisions

4.1 Acceptance Tests

4.1.1 Visual and Dimensional Examinations

See 3.3.1 for requirements.

4.1.2 Insulation Resistance

See 3.3.2 for requirements.

4.2 Qualification Tests

4.2.1 RaySeal devices shall meet the qualification requirements of Table III.

5.0 TEST PROCEDURES

5.1 Test Procedures

5.1.1 Test Conditions Unless otherwise specified herein, all inspection shall be made at ambient temperature, pressure, and humidity as specified in general requirements of MIL-STD-202.

5.1.2 Sample Preparation: RaySeal sleeves shall be installed in the mode of their primary function as specified on the applicable TE Connectivity specification control drawing.

5.1.3 Visual and Dimensional Examination

As Supplied RaySeal devices shall be visually examined, and the as-supplied dimensions shall be measured in accordance with TE Connectivity Customer Drawing D-260-C-X

5.1.4 Insulation Resistance (see 3.3.2). Installed RaySeal devices shall be tested in accordance with Method 302 of MIL- STD-202. The following details shall apply:

- Test condition: B
- Condition of RaySeal assembly: specimens shall be immersed as specified for at least 1 hour
- Points of measurement: Between specimens lead and water bath.
- Electrification time: 2 minutes

5.1.5 Dielectric Withstanding Voltage (see 3.3.3). Installed RaySeal device shall be tested in accordance with Method 301 of MIL-STD-202. The following details shall apply:

- Condition of specimens: Specimens shall be immersed as specified (see 5.1.6)
- Magnitude and nature of potential: 2,500 volts (RMS)
- Points of measurement: Between specimens leads and water bath.

5.1.6 Water bath: Unless otherwise specified in the applicable test method, a water bath containing 0.5% of an anionic wetting agent (P-D-410C) and 5.0% sodium chloride shall be used whenever immersion is specified. Free ends of leads shall be a minimum of 2 inches from top surface of water

5.1.7 Vibration (see 3.3.4). Install RaySeal devices on appropriately designated cable. The conductors leading from one end of the RaySeal device shall be rigidly mounted to a test fixture 1 inch in height and secured to the vibrating platform with a suitable clamp. The conductors leading from the opposite end of the devices shall be secured to a stationary support so that the center of the specimen is 6 inches from the vibrating platform and the tension on the wire allows between 1/8 and 1/4 inch of movement perpendicular to the axis of the specimen. The specimens shall be vibrated in accordance with MIL-STD-202, Method 204, test condition B. One axis shall be parallel to the specimen axis. After conditioning, slip resistance shall be performed in accordance with 5.1.16.

5.1.8 Thermal Shock (see 3.3.5). Installed RaySeal device shall be conditioned in accordance with MIL-STD-202, Method 107, and test condition F, except that the maximum temperature extreme shall be the maximum continuous operating temperature of the RaySeal device or wire, whichever is lower. After conditioning, the insulation resistance and slip resistance shall be measured in accordance with 5.1.4 and 5.1.16.

5.1.9 Heat Aging (see 3.3.6). Installed RaySeal devices shall be conditioned in an oven at a temperature of 260 ºC for a cycling period of 500 hours. Each cycle consist of 16 hours heating and 8 hours of cooling. Specimens shall be placed in the oven horizontally. After conditioning, insulation resistance, dielectric withstanding voltage, and slip resistance testing shall be performed in accordance with 5.1.5, and 5.1.16.

5.1.10 Fluid Resistance (see 3.3.7). Installed RaySeal devices shall be immersed in test fluids as specified in Table II. A separate specimen shall be immersed in each fluid. After the fluid immersion, dielectric withstanding voltage testing shall be performed in accordance with 5.1.5.

5.1.11 Flammability (see 3.3.8). Installed RaySeal device shall be suspended horizontally in a draft-free enclosure. A Bunsen burner with a 3/8 inch bore, 1/4 inch inlet and 4 inch length shall be connected to a natural gas source and adjusted to produce a 2 inch high flame with a 3/4 inch inner cone. The top of this inner cone shall be applied to the center of the RaySeal device under test. After 20 seconds, the flame shall be removed, and the length of time required for the flame to extinguish shall be recorded.

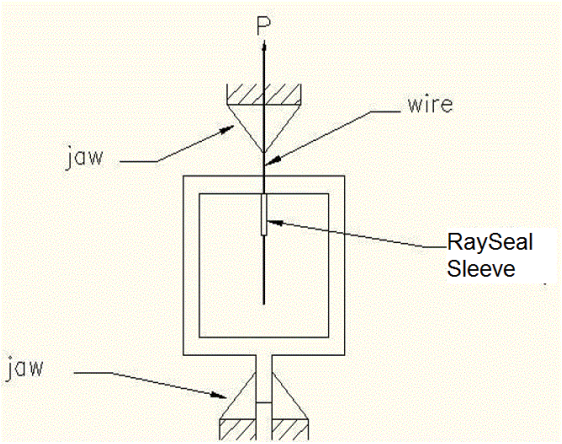
5.1.12 Altitude Immersion (see 3.3.9). Installed RaySeal device shall be immersed in water bath containing 0.5 percent of an anionic wetting agent so that the free ends of the leads are a minimum of 2 inches above the top surface of the water. After immersion for at least 30 minutes, insulation resistance shall be measured between the conductor lead and the water bath in accordance with MIL-STD- 202, Method 302, test condition B, with 2 minutes electrification time. Following the insulation resistance measurement, the immersed specimens shall be placed in a vacuum chamber. The vacuum chamber shall be evacuated to a pressure of 1 inch of mercury, maintained at this pressure for 30 minutes, and returned to ambient pressure. This shall constitute one cycle. A total of three cycles shall be performed. After the third cycle and while the specimen is still immersed, insulation resistance shall be measured as described above and the immersed specimen shall be subjected to dielectric withstanding voltage testing in accordance with 6.1.4, using the water bath as the outer electrode.

5.1.13 Copper Mirror Corrosion (see 3.3.10). RaySeal sleeves shall be tested in accordance with MIL-S-83519.

5.1.14 Immersion: The Installed RaySeal device shall be tested in accordance with Method 104, test condition C, of MIL-STD-202.

5.1.15 Moisture Resistance: The Installed RaySeal device shall be tested in accordance with Method 106 of MIL-STD-202 except sub cycle 7b shall not be required.

5.1.16 Slip resistance (see 3.3.11). Installed RaySeal device shall be placed in a standard tensile testing machine with the specimen being pulled thru a holding fixture that prevents the RaySeal assembly from passing thru the fixture hole. Specimen shall be gripped by the jaws at one end of the RaySeal assembly device and the other end should be free. Sufficient force shall be applied to cause slip failure. The travel speed of the head shall be 1 inch per minute. The clamping surfaces of the jaws may be serrated to provide sufficient gripping force.



6.0 Preparation for Delivery

6.1 Packaging and Packing. RaySeal devices shall be packaged and packed in accordance with standard commercial practice.

6.2 Marking. Unless otherwise specified in the procurement document, marking shall be in accordance with TE Connectivity customer drawing D-260-C-X.

7.0 NOTES

7.1 Intended Use: The RaySeal devices described in this specification are intended for use in repairing a damage primary wire that is either chaffed or has a radial crack on the insulation. They are suitable for usage within the limitations set forth in this document and in the applicable TE Customer drawing.

7.2 Ordering Data

Procurement documents should specify the following at a minimum:

(a) RaySeal repair sleeve part description – see TE CD.

(b) Quantity

7.3 Design Modification.

TE Connectivity reserves the right to make minor design modifications (which do not affect the form, fit or primary function of the product) without notification.

7.4 Storage Recommendations.

TE Connectivity RaySeal devices may be stored up to 5 years after the date of manufacture indicated on the label, provided that the following conditions are satisfied:

- The products are kept unopened in their original packages.
- The storage temperature does not exceed +50 °C or fall below +5 °C

If storage exceeds 5 years, or storage conditions are not as described above, the user should carry out tests on installed products to ensure that the RaySeal devices still seal and recover.

TABLE I – SLIP RESISTANCE

Part Description	Slip resistance minimum (lb_f)
D-260-C-A	10
D-260-C-B	12
D-260-C-C	14
D-260-C-D	16
D-260-C-E	18

TABLE II – FLUID IMMERSION

	Fluid	Immersion Time (hours)	Fluid Temperature (ºC)
1	Alkaline Detergent, (pH 10.0 -10.5)	24	23
2	Anti-Icing Fluid	24	23
3	Methyl Propyl Ketone, BMS11-9, Grade 1	7	23
4	Fuel Jet A, ASTM D1655	24	23
5	Isopropyl Alcohol, TT-I-735	24	23
6	Propylene Glycol (Dowfrost)	24	23
7	Potassium Formate (Aviform)	24	23
8	Hydraulic Fluid, Fire Resistant (Skydrol-LD4) BMS3-11 Type IV, Class 1	24	70
9	Hydraulic Fluid, QPL-5606-1 (formerly MIL-PRF-5606)	24	70
10	Hydraulic Fluid, MIL-PRF-87257	24	70
11	Lubricating Oil, MIL-PRF-23699	7	70

TABLE III - REQUIREMENTS

PROPERTY	UNIT	REQUIREMENTS	TEST METHOD
Insulation Resistance	ohms	5.0E+09	Section 5.1.4
Thermal Shock Followed by:	ºC	Five Thermal Shock Cycles Max. Rated Temp 260 and -65	Section 5.1.8 MIL-STD-202, Method 107, Test Cond 'F'
Insulation Resistance Slip Resistance	Ω Lb_f	5.0E+09 Table I	Section 5.1.4 Section 5.1.16
Vibration Followed by:	g	15 Peak Sine Vibration	Section 5.1.7
Insulation Resistance Dielectric Withstanding Voltage Slip Resistance	Ω V_{rms} Lb_f	5.0E+09 2,500 for 1 minute Table I	Section 5.1.4 Section 5.1.5 Section 5.1.16
Altitude Immersion Followed by:	Feet	75,000 (3 cycles)	Section 5.1.12
Insulation Resistance Immersion	Ω ºC	5.0E+09 Five Cycles; 1 cycle = Hot/65/60 minutes Cold/0/60 minutes	Section 5.1.4 Section 5.1.14 MIL-STD-202, Method 104, Test Cond 'C'
Insulation Resistance	Ω	5.0E+09	Section 5.1.4
Moisture Resistance			Section 5.1.15 MIL-STD-202, Method 106, Except Sub Cycle '7b'
Insulation Resistance	Ω	5.0E+09	Section 5.1.4
Heat Aging 500 hours at 260 ± 3ºC *(500 ±5ºF)*	ºC	500 hours at 260 ± 3ºC (500 ± 5ºF)	Section 5.1.9
Insulation Resistance Dielectric Withstanding Voltage Slip Resistance	V_{rms} Lb_f	5.0E+09 2,500 for 1 minute Table I	Section 5.1.4 Section 5.1.5 Section 6.1.15
Fluid Resistance Followed by:		Table II	Section 5.1.10
Dielectric Withstanding Voltage	V_{rms}	2,500 for 1 minute	Section 5.1.5
Flammability	Seconds	Self-extinguishing ≤ 5	Section 5.1.11
Copper Mirror Corrosion 16 hours at 200 ± 3ºC *(392 ±5ºF)*	%	Copper Removal < 10	Section 5.1.13