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CONNECTORS,  
HIGH RELIABILITY, SPACE USE,  
GENERAL SPECIFICATION FOR

JAXA  
JAPAN AEROSPACE EXPLORATION AGENCY

This specification was originally written and established in the Japanese language. This specification has been translated into English for international users. Note that this document is a working document for international users. Any discrepancies found in this document should be verified against the latest Japanese document before any significant decisions are made.

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<b>Revision Record</b>			
Rev.	Date	Revised Contents	
A	31 Mar. 04	(1) Revised to reflect the organizational change from NASDA to JAXA. (2) Renumbered sections/paragraphs in accordance with Appendix A of JAXA-QTS-2000. (3) Replaced terminologies with those used in the generic specification.	
B	31 Mar. 06	(1) Changed the contact dimensions in Appendix C. (2) Clarified the reference contact dimensions in Appendixes C and D. (3) Reviewed duplicated test items in the qualification test, renumbered sections/paragraphs and made relevant corrections in Appendixes B, C, and D.	
C	25 Jun. 08	(1) Added Appendix F; Connectors, Rectangular, Microminiature. (2) Corrected as follows to ensure consistency. Paragraph 2.2: Deleted NASDA-STD-7 (obsolete document). Paragraph 2.2: Deleted referential MIL or ESA specifications for appendixes and specified in each appendix. Paragraph 3.3.2: Specified calculation procedure for outgassing. Paragraph 4.5.2.4: Corrected to ensure consistency between main body and appendixes. Paragraph *.4.2.2, *.4.2.3: Deleted duplicative specification of main body. Table B-28: Specified that the samples used to test plating porosity can not be delivered as the test is a breakdown test. Supplementary Figure C-23 and D-19: Corrected figures in accordance with actual test method.	

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**CONNECTORS,  
HIGH RELIABILITY, SPACE USE,  
GENERAL SPECIFICATION FOR**

## 1. GENERAL

### 1.1 Scope

This specification establishes the general requirements and quality assurance provisions for high reliability, connectors (hereinafter referred to as "connectors") used for electronic equipment installed on space systems.

This specification complies with JAXA-QTS-2000 (Common Parts/Materials, Space Use, General Specification for) which was recently established to transition to the qualified manufacturing line system and replaces the following specifications.

- a) NASDA-QTS-1028A                      Connectors, Circular, Miniature, High Density, High Reliability, Space Use (NASDA NR 03)
- b) NASDA-QTS-1029A                      Connectors, Circular, Miniature, High Reliability, Space Use (NASDA NR 04)
- c) NASDA-QTS-24308A                      Connec24308A/102Ators, Rectangular, Miniature, High Reliability, Space Use (NASDA ND 101)
- d) NASDA-QTS-24308A/102A              Accessories for Connectors, Rectangular, Miniature, High Reliability, Space Use (NASDA ND 102)

### 1.2 Terms and Definitions

The definitions for terms used herein are as shown in paragraph 6.3 of this specification.

### 1.3 Classification

Capacitors covered by this specification shall be classified as specified in Table 1.

**Table 1 Classification**

Classification	Appendix	Equivalent QPL specification
Connectors, Circular	B	NASDA-QTS-1028A NASDA-QTS-1029A
Connectors, Rectangular, Miniature	C	NASDA-QTS-24308A
Connectors, Rectangular, Miniature, High Density	D	None
Accessories for Connectors, Rectangular, Miniature and Connectors, Rectangular, Miniature, High Density	E	NASDA-QTS-24308A/102A

### 1.4 Part Number

The part number shall be as specified in each appendix.

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2. APPLICABLE DOCUMENTS			
2.1 Applicable Documents			
The documents listed below form a part of this specification as specified herein. These documents are the latest issues available at the time of contract award or application. If it is necessary to designate an issue, the issue shall be specified in the detail specification.			
a) JAXA-QTS-2000	Common Parts/Materials, Space Use, General Specification for		
b) MIL-STD-202	Test Method Standard, Electronic and Electrical Component Parts		
c) MIL-HDBK-454	General Guidelines For Electronic Equipment		
d) MIL-STD-1344	Test Methods for Electrical Connectors		
e) MIL-STD-1560	Insert Arrangements for Mil-Dtl-38999, Mil-C-29600 Series A, And Mil-C-27599 Electrical, Circular Connectors		
f) MIL-STD-1669	Insert Arrangements for MIL-C-26482 Environment Resisting, Circular, Electrical Connectors		
g) MIL-DTL-22520	Crimping Tools, Wire Termination, General Specification for		
h) MIL-W-22759	Wire, Electrical, Fluoropolymer-Insulated, Copper or Copper Alloy		
i) MIL-C-26482	Connectors, Electrical (Circular, Miniature, Quick Disconnect, Environment Resisting), Receptacles and Plugs, General Specification for		
j) MIL-C-39029	Contacts, Electrical Connector, General Specification for		
k) MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance		
l) MIL-I-81969	Installing and Removal Tools, Connector Electrical Contact, General Specification for		
m) MIL-PRF-23699	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base		
n) MIL-DTL-16878	Wire, Electrical, Insulated, General Specification for		
o) MIL-DTL-81381	Wire, Electric Polyimide-Insulated, Copper or Copper Alloy		
p) MIL-DTL-38999	Connectors, Electrical, Circular, Miniature, High Density, Quick Disconnect (Bayonet, Threaded, and Breech Coupling), Environment Resistant, Removable Crimp and Hermetic Solder Contacts, General Specification for		
q) SAE-AMS2418	Copper Plating		
r) SAE-AMS2422	Plating, Gold		
s) SAE-AS31971	Pin, Gage, for Socket Contact Engagement Test		
t) SAE-AMS-C-26074	Coatings, Electroless Nickel, Requirements for		
u) ASTM B 488	Gold for Engineering Uses, Electrodeposited Coatings of		
v) ASTM B 733	Metal, Autocatalytic Electroless Nickel-Phosphorus Coatings on		
w) MS 3461	Test Gauge, MIL-C-26482 Series 2 or MIL-C-81703 Series 3 Contact Retention Feature		
x) MS 27488	Plug, End Seal, Electrical Connector		

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<ul style="list-style-type: none"> <li>y) GSFC S-311-P-13</li> <li>z) JIS B 7507</li> <li>aa) JIS Z 9015-1</li> <li>ab) ASTM E595</li> </ul>	<ul style="list-style-type: none"> <li>Wire, Electrical, Radiation Crosslinked Polyalkalene Insulated, Tin-Coated Copper, 2500Volt, for Space Flight Use, Detail Specification for Vernier, Dial and Digital Callipers</li> <li>Sampling Procedures for Inspection by Attributes --- Part 1: Sampling Plans Indexed by Acceptable Quality Level (AQL) for Lot-by-Lot Inspection</li> <li>Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment</li> </ul>		
<p>2.2 Reference Document</p>	<p>The following documents are reference documents.</p>		
<ul style="list-style-type: none"> <li>a) JERG-0-035</li> <li>b) NASDA-STD-8739.4</li> </ul>	<ul style="list-style-type: none"> <li>NASDA Parts Application Handbook</li> <li>Crimping, Interconnecting Cables, Harnesses, and Wiring</li> </ul>		
<p>2.3 Order of Precedence</p>	<p>In the event of a conflict between the text of this specification and the applicable documents, the following order of precedence shall apply.</p> <ul style="list-style-type: none"> <li>a) Detail specification</li> <li>b) This specification</li> <li>c) JAXA-QTS-2000</li> <li>d) Applicable documents of this specification (paragraph 2.1, except for JAXA-QTS-2000)</li> </ul>		
<p>2.4 Detail Specification</p>	<p>Detailed requirements for the type and performance of connectors are specified in each detail specification.</p> <p>The detail specification shall be prepared and established by a manufacturer in accordance with Section A.4 of JAXA-QTS-2000. The detailed specification shall also be registered with the Japan Aerospace Exploration Agency (hereinafter referred to as "JAXA").</p>		
<p>2.4.1 Detail Specification Number</p>	<p>The detail specification number shall be indicated in the following form in accordance with paragraph A.2.2.2 of JAXA-QTS-2000. The individual identification shall be identified by a three-digit number. The first digit shall indicate a certified manufacturer and the following two-digit shall indicate series number.</p>		

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<p>(Example)</p> <div style="text-align: center;"> </div>			
2.4.2	Revision Letter of Detail Specification		
<p>A revision letter in the detail specification number shall be assigned in accordance with paragraph A.2.2.2.4 of JAXA-QTS-2000.</p>			
2.4.3	Independency of Detail Specification		
<p>The detail specification shall be a stand-alone document with a unique number defined in accordance with paragraph 2.4.1.</p>			
2.4.4	Format of Detail Specification		
<p>The detail specification format shall be in accordance with A.6 b) of JAXA-QTS-2000 and shall specify each requirement in accordance with A.4 of JAXA-QTS-2000.</p>			
<h3>3. REQUIREMENTS</h3>			
3.1	Certification		
3.1.1	Qualification Coverage		
<p>Qualification coverage shall be as specified in each appendix and detail specification in accordance with paragraph A.3.3.2.1 of JAXA-QTS-2000.</p>			
3.1.2	Initial Qualification		
<p>To acquire certification of the capacitors in compliance with this specification, a manufacturer shall establish a quality assurance program in accordance with paragraph 3.3.1 of JAXA-QTS-2000, perform the qualification tests specified in paragraph 4.4, and acquire a certification status from JAXA as specified in paragraph 3.4.1 of JAXA-QTS-2000. The manufacturer shall be listed on the Qualified Manufacturer List of the Japan Aerospace Exploration Agency (JAXA QML).</p>			
3.1.3	Retention of Qualification		
<p>To continue supplying capacitors in accordance with this specification, a manufacturer must apply for QML certification retention in accordance with paragraph 3.4.2.1 of JAXA-QTS-2000 commencing between 30 and 60 days prior to the expiration date of the certification period (paragraph 3.1.4). If products were not shipped during the effective period of certification and a quality conformance inspection was not conducted, the manufacturer may apply for retention of certification without conducting the quality conformance inspection.</p>			

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3.1.4	Effective Period of Certification The effective period of certification granted in compliance with this specification shall be three years.		
3.1.5	Change of Qualification Coverage To change the qualification coverage, the manufacturer shall perform procedures for re-certification in accordance with paragraph 3.4.3 of JAXA-QTS-2000.		
3.2	Quality Assurance Program		
3.2.1	Establishment of a Quality Assurance Program To acquire certification in compliance with this specification, the manufacturer shall be responsible for establishing a quality assurance program that satisfies the requirements specified in paragraph 3.3.1 of JAXA-QTS-2000 and this specification. The manufacturer shall generate a Quality Assurance Program Plan in accordance with paragraph 3.3.2 of JAXA-QTS-2000 and provide the plan to JAXA for review in accordance with paragraph 3.3.6 of JAXA-QTS-2000.		
3.2.2	TRB Formation To acquire a certification status in compliance with this specification, the manufacturer shall form and operate the Technical Review Board (TRB) in accordance with paragraph 3.3.5 of JAXA-QTS-2000.		
3.3	Materials		
3.3.1	General Materials used for manufacturing connectors shall be specified in this specification. If a specific material is not specified, a material which enables the connectors to satisfy the requirements of this specification shall be used and the material shall be specified in the document defining the manufacturing conditions of the quality assurance program. Detailed requirements for the materials shall be as specified in each appendix and as follows.		
3.3.2	Outgassing Unless otherwise specified, organic materials used for connectors shall satisfy the following requirements when tested in accordance with ASTM E 595. Outgassing from whole organic materials shall be evaluated using the outgassing measurements of each organic material in consideration of the weight allocation. a) Total Mass Loss (TML): 1.0% or less b) Collected Volatile Condensable Material (CVCM): 0.1% or less Note: <sup>(1)</sup> TML: Total Mass Loss <sup>(2)</sup> CVCM: Collected Volatile Condensable Materials		
3.4	Design and Construction Design and construction shall be in accordance with each appendix. Detailed requirements shall be specified in the detail specifications.		

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3.5	Externals, Dimension, Mass and Marking The externals, constructions, dimensions, mass and markings of the connectors shall be as specified in each appendix.		
3.6	Workmanship The workmanship of the connectors shall be as specified in each appendix.		
3.7	Rating The ratings of the connectors shall be as specified in each appendix.		
3.8	Electrical Performance Requirements for the electrical performance of the connectors shall be in accordance with each appendix.		
3.9	Mechanical Performance Requirements for the mechanical performance of the connectors shall be in accordance with each appendix.		
3.10	Environmental Performance Requirements for the environmental performance of the connectors shall be in accordance with each appendix.		
3.11	Durability Performance Requirements for the durability performance of the connectors shall be in accordance with each appendix.		
4.	QUALITY ASSURANCE PROVISIONS		
4.1	General Requirements The manufacturer shall be responsible for implementing the quality assurance program as specified in paragraph 3.2 and operating the TRB.		
4.2	Classification of Test and Inspection The tests and inspections shall be classified into the following three categories in accordance with paragraph 4.3 of JAXA-QTS-2000. a) In-process inspection b) Qualification test c) Quality conformance inspection		
4.3	In-Process Inspection The manufacturer shall perform the in-process inspections as specified below to detect any failure which could seriously affect the reliability and quality of the products, assure the workmanship and characterize properties which cannot be measured using the finished products. The manufacturing flowchart in the quality assurance program plan shall define the inspection process.		

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<ul style="list-style-type: none"> <li>a) Internal visual inspection of semi-finished products (non-destructive, 100% or sampled inspection)</li> <li>b) Physical or chemical inspection of semi-finished products (destructive or non-destructive, 100% or sampled inspection)</li> <li>c) Characterization of semi-finished products (non-destructive, 100% or sampled inspection)</li> </ul>			
4.4 Qualification Test			
4.4.1 Sample Samples shall be manufactured using the process and control as specified in the quality assurance programs and shall also typify the qualification coverage.			
4.4.2 Manufacturing Records The manufacturer, which intends to acquire certification status, shall archive material certification, receiving inspection data or test data of materials used, work records related to sample preparation, and in-process inspection data. These records shall be readily available upon request.			
4.4.3 Test Items and Number of Samples Test items, test sequence and sample size shall be in accordance with each appendix.			
4.4.4 Criteria for Pass/Fail A failure of any test in the qualification tests specified in each appendix shall constitute failure of the qualification tests. If the failure mode of the defects is catastrophic such as an open- or short-circuiting where the function of the connectors might be lost, the connectors fail the qualification test.			
4.4.5 Disposition after Inspections (Qualification Test) When failed in the qualification test, the manufacturer shall review all the materials and manufacturing processes and take corrective actions to re-perform the qualification test. JAXA has the right to determine the test items to be re-performed (all or some of test items). The products in the same inspection lot that have passed the qualification test may be delivered upon passing the Group A inspection of the quality conformance inspection.			
4.5 Quality Conformance Inspection			
4.5.1 Quality Conformance Inspection (Group A) Group A inspections shall be performed at the time of production for all products.			
4.5.1.1 Sample Selection of test samples for Group A inspections lots shall be defined as a part of the manufacturing conditions in the quality assurance program.			

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4.5.1.2	<p><b>Inspection Items and Sample Size</b></p> <p>Inspection items, inspection order and samples size in Group A inspection shall be as specified in each appendix.</p>		
4.5.1.3	<p><b>Criteria for Pass/Fail</b></p> <p>A failure of any test specified in the Group A inspections shall constitute failure of the quality conformance inspections. If the failure mode of the defects is catastrophic such as an open- or short-circuiting where the function of the connectors might be lost, the connectors fail Group A of the quality conformance inspections.</p>		
4.5.1.4	<p><b>Disposition after Inspections</b></p> <p>The lots rejected in the Group A inspection shall not be delivered. Details shall be specified in each appendix.</p>		
4.5.2	<p><b>Quality Conformance Inspection (Group B or C)</b></p> <p>Groups B and C inspections shall be performed in compliance with the following schedule.</p> <ol style="list-style-type: none"> <li>a) The Group B inspection shall be performed on the first lot manufactured within the certification period.</li> <li>b) When retention of certification is granted, the Group C inspection shall be performed prior to the restart of production when no products were manufactured within the previous certification period and no quality conformance inspection was performed.</li> </ol>		
4.5.2.1	<p><b>Sample</b></p> <p>Inspection lots for Groups B and C inspections shall consist of samples that have passed Group A inspections.</p>		
4.5.2.2	<p><b>Inspection Items and Sample Size</b></p> <p>Inspection items, inspection order and the sample size of Group B or C inspection shall be as specified in each appendix.</p>		
4.5.2.3	<p><b>Criteria for Pass/Fail</b></p> <p>A failure of any inspection specified in the Group B or C inspections shall constitute failure of the quality conformance inspection of each group. If the failure mode of the defects is catastrophic such as an open- or short-circuiting where the function of the connectors might be lost, the capacitor fails the Group B or C inspections.</p>		
4.5.2.4	<p><b>Disposition after Inspections</b></p> <p>The samples used for the Group C inspections shall not be delivered. If the samples fail in the Group B or C inspections, the manufacturer shall conduct a failure analysis on the defects and take corrective action. Delivery of the products shall be suspended until JAXA approves the corrective actions.</p>		
4.6	<p><b>Method for Test or Inspection</b></p> <p>Procedures for tests or inspections shall be as specified in each appendix.</p>		

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4.6.1	Materials Test method for materials shall be as specified in each appendix.		
4.6.2	Externals, Dimension, Mass, and Marking Test methods for externals, dimensions, mass, and marking of the connectors shall be as specified in each appendix.		
4.6.3	Workmanship Test methods regarding workmanship of the connectors shall be as specified in each appendix.		
4.6.4	Electrical Performance Test methods regarding the electrical performance of the connectors shall be as specified in each appendix.		
4.6.5	Mechanical Performance Test methods regarding the mechanical performance of the connectors shall be as specified in each appendix.		
4.6.6	Environmental Performance Test methods regarding the environmental performance of the connectors shall be as specified in each appendix.		
4.6.7	Durability Performance Test methods regarding the durability performance of the connectors shall be as specified in each appendix.		
4.7	Long-Term Storage		
4.7.1	Disposition of Lots Stored for a Long-Term at the Manufacturer's Site When connectors have been stored at the manufacturer's site for 24 months or longer after the Group A inspections of the quality conformance inspection, the manufacturer shall perform 100% inspection for all test items of Group A inspections other than dimensions and mass prior to delivery. Only the connectors which have passed the inspections can be shipped as products. See paragraph 4.3.4.1 of JAXA-QTS-2000 for other details.		
4.7.2	Storage by Purchasers Instructions for storage by purchasers shall be as follows. The storage condition and storage time limit shall be specified in the detail specification, if required. a) Connectors shall be stored at normal temperature and humidity. b) Package bags shall be opened immediately before use. In the case of opened package, the package bag shall be hermetically heat sealed to store. c) When storing demated connectors, dust caps shall be attached. d) Avoid subjecting to direct sunlight or placing directly on the floor.		

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<p>e) Do not drop connectors during carriage.</p>			
<p>4.8 Change to Tests and Inspections</p> <p>Any change in the in-process inspection and quality conformance inspection specified in this specification shall be made in accordance with paragraphs 4.4 and 6.1 of JAXA-QTS-2000.</p>			
<p>5. PREPARATION FOR DELIVERY</p> <p>Preparation for delivery shall be as follows and as specified in Section 5 of JAXA-QTS-2000.</p>			
<p>5.1 Packaging</p> <p>The capacitors shall be appropriately packaged as follows not to adversely affect the products during handling or shipment. The package specifications shall be included in the quality assurance program.</p> <p>a) A dust cap shall be attached to the mating area of connector. Contacts shall be placed in a case which will prevent damage during storage or carriage. Each product shall placed in a transparent polyethylene bag and heat sealed.</p> <p>b) Sealed packaged connectors shall be packaged with a tag indicating product name, required marking items and notes (example: Care shall be taken when handling as the product has been cleaned for space use.).</p>			
<p>5.2 Marking on Package</p> <p>Each shipping package shall have the following markings.</p> <p>a) Part name</p> <p>b) Part number</p> <p>c) Applicable specification number</p> <p>d) Lot identification code</p> <p>e) Purchaser's name</p> <p>f) Manufacturer's name</p> <p>g) Quantity of packages</p> <p>h) Date of inspection</p> <p>i) Inspection result</p>			
<p>6. NOTES</p>			
<p>6.1 Notes for Manufacturer</p>			
<p>6.1.1 Preparation and Registration of Application Data Sheet</p> <p>The manufacturer shall prepare the Application Data Sheet in accordance with Appendix G of JAXA-QTS-2000 and register it with JAXA.</p>			
<p>6.2 Notes for Acquisition Officers</p> <p>Acquisition officers shall open the sealed package immediately before using the connectors purchased in accordance with this specification. Refer to the Application Data Sheet for the detailed data of the products and notes.</p>			

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<p>6.2.1 Items to be Specified for Procurement</p> <p>To purchase connectors manufactured in compliance with this specification, the purchaser shall provide the following information.</p> <ul style="list-style-type: none"> <li>a) Part number</li> <li>b) This specification number</li> <li>c) Detail specification number</li> <li>d) Indication of test data or source inspection results to be submitted for delivery</li> <li>e) Others</li> </ul> <p>For item e), requirements other than those defined in this specification may be specified for special applications. However, if the requirements conflict with the existing requirements in this specification, the purchaser shall not request that the manufacturer indicate that the capacitors comply with this specification.</p> <p>6.3 Terms and Definitions</p> <p>The following terms are defined in this specification.</p> <p>6.3.1 Common to All Connector Types</p> <ul style="list-style-type: none"> <li>a) Insert A part that holds the contacts in their proper positions and electrically insulates contacts from each other and from the shell.</li> <li>b) Contact A part that provides electrical connection when connectors are mated. Contacts are constructed so that applicable wires can be terminated.</li> <li>c) Contact retention clip A part placed in a pre-defined position of the insert to hold the contacts.</li> <li>d) Sealing plug A plug that fills an unused contact hole at the wire end of resilient insulating material.</li> <li>e) Shell An outer case that securely houses and protects inserts. The shell has provisions for alignment required for mating with its counterpart connector for mounting to a panel.</li> <li>f) Sleeve A tubular covering placed over a socket mating end which holds the contact spring in the correct position within the socket contact.</li> <li>g) Prove damage Damage of a socket contact caused by screwing a pin contact into the socket contact.</li> <li>h) Wire barrel A portion of a contact termination end which accommodates a conductor of applicable gauge wire.</li> </ul> <p>6.3.2 Specific to Circular Connectors</p> <ul style="list-style-type: none"> <li>a) Polarization The physical structure that determines the mating position of connectors and avoids erroneous mating by changing the key position.</li> </ul>			

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<ul style="list-style-type: none"><li>b) Coupling pin A pin that is fixed to the outer perimeter of the receptacle and mates with a coupling nut of the plug to insert and lock, or demate connectors.</li><li>c) Spring finger Springs installed around the shell periphery to improve electrical contact between the mated shells.</li><li>d) Plug A shell that is attached not to a panel or chassis but to the free end of a cable.</li><li>e) Receptacle A shell having a structure that can be mounted to a panel, chassis or bulkhead.</li></ul> <p>6.3.3 Specific to Miniature Rectangular Connectors, and High Density Miniature Rectangular Connectors</p> <ul style="list-style-type: none"><li>a) Oversize pin A pin which has a diameter larger than the specified size for the pin contact.</li><li>b) Screw lock A metal part that keeps mated connectors together using screws or springs under conditions where shock or vibration is applied.</li><li>c) Closed-entry A design feature provided at a socket mating end or socket contact cavity to prevent possible damage to the socket contact spring due to insertion of an oversize pin contact, or application of excessive force.</li><li>d) Maintenance aging A test that determines if crimp contacts can withstand repetitions of inserting into and removing from an insert.</li></ul> <p>6.3.4 Specific to Accessories for Miniature Rectangular Connectors and High Density Miniature Rectangular Connectors</p> <ul style="list-style-type: none"><li>a) Screw lock A metal part that keeps mated connectors together using screws or springs under conditions where shock or vibration is applied.</li></ul>			