NOTE

The product described in this document has not been fully tested to ensure conformance to the requirements outlined below. Therefore, TE Connectivity (TE) makes no representation or warranty, express or implied, that the product will comply with these requirements. Further, TE may change these requirements based on the results of additional testing and evaluation. Contact TE Engineering for further details.

X-Low Insertion Force 250 F-Spring Connector

1. SCOPE

1.1. Content

This specification covers performance, tests, and quality requirements for X-LIF 250 F-Spring straight terminals and housing.

The terminal must work with related housing, housing PN listed in the end of this spec.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 2 shall be used.

All inspections shall be performed using the applicable inspection plan and product drawing.

2. APPLICABLE DOCUMENTS AND FORMS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. TE Connectivity Specifications

114-106568	Application Specification
501-106568	Qualification test report for non-stress relief version
501-161690	Qualification test report for Stress Relief version

2.2. Commercial Standards and Specifications

IEC 61210	Flat quick-connect terminations for electrical copper conductors - Safety requirements
IEC 60512	International Standard – Connectors for Electronic Equipment – Tests and Measurements
EIA-364	Electrical Connector/Socket Test Procedures Including Environmental Classifications

“For updated standards and specifications, the latest edition of the reference document applies.”

2.3. Reference Documents

109-1	General Requirements for Testing
102-950	Qualification of Separable Interface Connectors

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction, materials, and physical dimensions specified on the applicable product drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable TE drawing.

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3.3. Ratings

A. Voltage Rating: 600 VAC

B. Testing Tab:

- For test item, shall be made of unplated brass, identified as CDA C26000 Alloy with a hardness of 62 ±7 on the Rockwell 30Tscale.
- TE test Tab PN: 62627-3

C. Temperature Rating:

1. Brass Contacts (Tin Plated or Un-plated): 110°C (maximum) for POSITIVE LOCK Standard

D. Current Rating: See Figure 1.

Cat.	Wire Size		Current [A]
	AWG	mm^2	
2379911-X	14	2.0	15
	16	1.3	10
	18	0.82	7

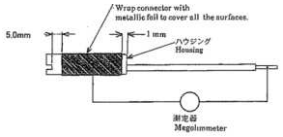
Figure 1

3.4. Performance Requirements and Test Description

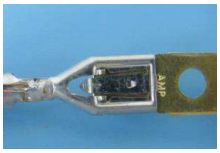
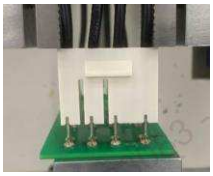
The product should meet the electrical, mechanical, and environmental performance requirements specified in Figure 2. All tests shall be performed at ambient environmental conditions otherwise specified.

3.5. Test Requirements and Procedure Summary

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Examination of Product	Meets requirements of product drawing and TE application specification. Parts show no signs of damage or physical change.	EIA-364-18 Visual, dimensional, and functional as per applicable inspection plan.
ELECTRICAL		
Low Level Contact Resistance	Initial: 3 milliohms (mΩ) maximum Final: 6 milliohms (mΩ) maximum	IEC 60512-2-2, EIA 364-23 Subject the mating terminals to 100mA(DC) current and 20mV maximum open circuit voltage. After temperature has stabilized, probe 2 points on the mated tab contact that with one point 75 mm from the wire crimp. Calculate resistance after deducting bulk wire.
Insulation resistance	1000 MΩ Min.	EIA-364-21 Sample connector is subjected to test in accordance with Test condition “B” Test method 302 of MIL-STD-202 by applying test

		potential of 500V DC ±10% between contact and the ground. 
Dielectric withstanding voltage	No abnormalities, such as breakdown and flashover, shall occur, and withstand test potential of 2000V AC for 1 minute.	EIA-364-20 Sample connector is subject to be tested in accordance with Test Method 301 of MIL-STD-202, by applying test potential of 2000 AC (RMS) for 1 minute, between contact and the ground. After the duration, inspect visually for evidence of insulation breakdown and flashover on the hosing surfaces.
Current cycling	Test current should align with wire, refer to UL-310 Temperature rise between T1 and T2 shall not exceed 15°C. Neither T1 nor T2 shall exceed 85°C.	IEC 61210 Subject terminals to 500 cycles. T1 shall be measured after the 24th cycle and T2 shall be measured after the 500th cycle. Terminals terminated overload test current to be 200% of the nominal test current. One cycle includes 45 minutes on and 15 minutes off.
Temperature rise vs current (Derating Curve)	Temperature rise shall not exceed 30°C.	EIA 364-70, Method 2, Contact loaded connector is subject to be tested by applying test current of specified intensity. Measurement is done after temperature rising of connector becomes stabilized, by probing on wire crimp of contact with the use of thermocouple.

MECHANICAL		
TEST DESCRIPTION	**REQUIREMENT**	**PROCEDURE**
Crimp Tensile Strength	**Wire Size [AWG]** / **Min. Tensile Force [N (lbs.)]** 18 [0.82] — 89 (20) 16 [1.3] — 133 (30) 14 [2.1] — 223 (50)	IEC 61210 Operation Speed: 25.4 mm/min Measure the force required to break or pull-out wire from wire barrel crimp. Insulation barrel crimp shall not be fully closed. Damage to other portions of terminals acceptable. May require custom fixturing to hold terminal without deforming the wire crimp barrel.

Mating Force (TAB inset into receptacle)	15N maximum for Stress relief version 10N maximum for non-Stress relief version	IEC 60512-13-2 Operation Speed: 50 mm/min Max Apply an axial push force mate the tab to receptacle terminal. (plain test tab: 62627-3)
Locking Force (Tab extract from receptacle)	67N minimum 	IEC 60512-13-2 Operation Speed: 50 mm/min max. Measure the force required to Apply an axial pull force to release the tab from the receptacle (with locking feature) (plain test tab: 62627-3)
Insertion force (Tabs inset into connector)	15N maximum/cavity 	IEC 60512-13-2 Operation Speed: 50 mm/min Max Apply an axial push force insert connector to holder
Retention force (Receptacle extract from housing)	45N minimum 	IEC 60512-13-2 Operation Speed: 50 mm/min Max Apply an axial pull force to extract the Receptacle from the housing, force applied on the wire.
Vibration	No physical damage. No discontinuities ≥1 microsecond	EIA-364-28, Test Condition I Subject mated connectors to 10-55-10 Hz traversed in 1 minute at 1.52mm amplitude 2 hours each of 3 mutually perpendicular planes. Vibration testing is performed at the 18℃ temperatures rise current level.
Mechanical shock	No physical damage. Termination Resistance 6.0mΩ Max.	EIA-364-27, Condition H, Subject mated specimens to 30 G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 cycles total shocks.

ENVIRONMENTAL

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Temperature and humidity cycling	See note	EIA-364-31, Test condition follow figure 4
Thermal shock	No physical damage	EIA-364-32 Contact loaded and mated connector assembly is subject to be tested in accordance with Test Condition A, Test Method 107 of MIL-STD-202, by the following sequence of temperature changing for 5 cycles. After conditioning, sample connector shall be tested
		Sequence / Test condition
		1 / 105±5°C for 30 minutes
		2 / Room temperature for 5
		3 / -40±5°C for 30 minutes
		4 / Room temperature for 5
Durability Repeated Insertion/withdrawal (without Lock)	Termination Resistance 6.0mΩ Max.	UL-310 Per 6.4 Th connectors shall be inserted and withdrawn from test tabs 6 times for test group1 and 5 times for test group 2. All withdrawal cycles shall be conducted and measured with the latch unlocked.
Salty spray	Final Termination Resistance: 6mΩ (maximum)	EIA-364-26,Test condition A Subject mated specimen to 5% salty condition for 96 hours. After this test, rinse the samples in water, sit it for 1 hour for drying at room temperature of 38 °C ±3 °C.
Glow Wire Test	Test at 850°C (Flame duration ≤ 30 seconds after probe removal). For GWT versions, test also at 750°C (Flame duration ≤ 2 seconds). Lighted tissue paper shall not burn.	IEC 60695-2-11 and IEC 60335-1: Tests to be conducted on each of 3 perpendicular sides.

Figure 2 (end)

NOTE

Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 3.

3.6. Product Qualification and Requalification Test Sequence(a)

TEST OR EXAMINATION	TEST GROUP								
	A(c)	B(d)	C	D(e)	E	G	F	G	
	TEST SEQUENCE (b)								
Examination of product	1,12	1,3	1,5	1,8	1,3	1,5	1,3	1,3	1,3
Mating force						2			
Locking force						4			
Insertion force							2		
Retention force								2	
Crimp tensile strength									2
Low Level Contact resistance(f)	2,5,7,9,11		2,4						
Insulation resistance				2,6					
Dielectric withstanding voltage				3,7					
Temperature rises vs current (Derating Curve)	3								
Durability, preconditioning(g)	4(2times)					3(5times)			
Thermal shock(h)				4					
Temperature and humidity cycling(i)	6			5					
Vibration	8								
Mechanical shock	10								
Current Cycling		2							
Salt spray			3						
GWT					2				

Figure 3

NOTE

a) Samples shall be prepared in accordance with applicable instruction sheets. They shall be selected at random from current production.

b) Numbers indicate sequence in which tests are performed.

c) Test Group A verifies the ability of the connector to carry its rated current and establishes an end-of-life current rating. The environmental and mechanical conditioning are intended to represent conditions experienced by the connector while in service.

d) Test Group B, Current cycling is an accelerated aging test. It can cause temperature cycling of the terminal material, cause thermal expansion and cold contraction, resulting in fretting corrosion of the tin coating contact interface, oxidation phenomenon and intermetallic compounds; It is also possible to wear the contact interface of the thin gold plating. In addition, the current cycling can cause the separable contact interface to rapidly oxidize due to ultra-high temperatures, resulting in failure. The current cycle may also cause the perturbation of the connection area in the permanent connection area due to thermal expansion and contraction, thereby inducing connection failure.

e) Test Group D measures the insulating material of the connector using thermal shock and humidity-temperature cycling.

f) LLCR is optional measurements used for verification/failure identification purposes

g) Durability test is to make the connector terminals perform several pre-insertion tests, the purpose of this test is to simulate several plugs and unplugs that may occur during the assembly process of the product, such as the conduction test to be performed during wire harness production, which may cause the connector terminals to be plugged and unplugged. It should be noted that in this step of the test, the terminal cannot be plugged in all pluggable lifetimes, so it is not a simulation of the actual use state. For Positive Lock terminals, usually 3 times is reasonable.

h) Thermal shock test, the purpose of this test is to simulate the failure of the connector housing due to transportation, resulting in the failure of the positioning or mechanical resistance of the terminal. This kind of simulated transportation can be understood as a complete machine, manufactured in the south, but shipped to the north to sell.

i) Temperature and humidity cycle test, the purpose of this test is to oxidize the tinning on the surface of the terminal, it is possible that this oxide will penetrate the contact interface of the male and female terminals, so that the contact resistance increases, and the terminal contact fails.

Test condition for humidity and temperature cycling should follow figure 4

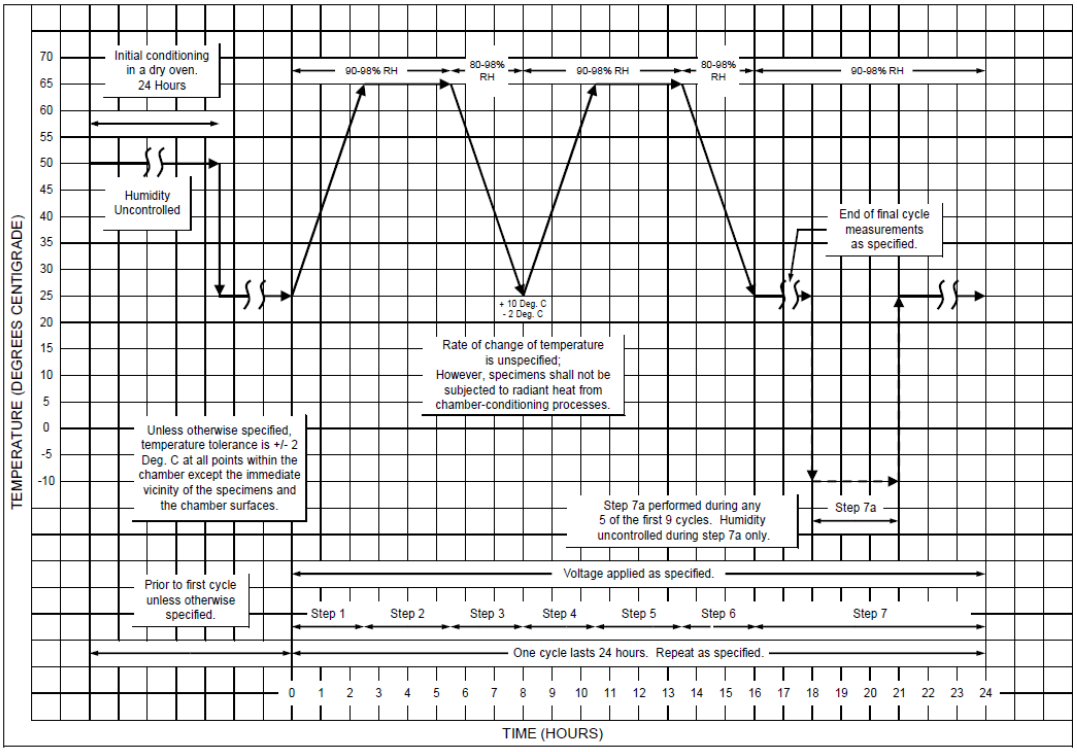


Figure 4. graphical representation of method, cycling temperature – humidity with optional cold shock

4. QUALITY ASSURANCE PROVISIONS

4.1. Test Conditions

Unless otherwise specified, all the tests shall be performed in any combination of the following test conditions shown in Figure 55.

Temperature	15°C – 35°C
Relative Humidity	45% – 75%
Atmospheric Pressure	86.6 – 106.6 kPa

Figure 5

4.2. Qualification Testing

A. Specimen Selection

Specimens shall be prepared in accordance with applicable instruction sheets(114-106568) and shall be selected at random from current production.

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 3.

4.3. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality, and reliability engineering.

4.4. Acceptance

Acceptance is based on verification that the product meets the requirements in Figure 2. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken, and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.5. Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

Note: Wire sizing based upon UL1015 wire

AWG	CMA	Stranding		
		Strands		Φ inch
18	1600	16	x	.0100
16	2600	26	x	.0100
14	4100	41	x	.0100

5. SAMPLE PREPARATION

For sample prepare, there are some of the special requirement

a. All sample should as mass production status,

b. For connector mating force test, if the housing is 2380041-X or 2379907-X the Tab should use 2348072-1, Tin plated, solder to test PCB, shown as figure 5, Tab and PCB should meet 90° +/-2° requirement

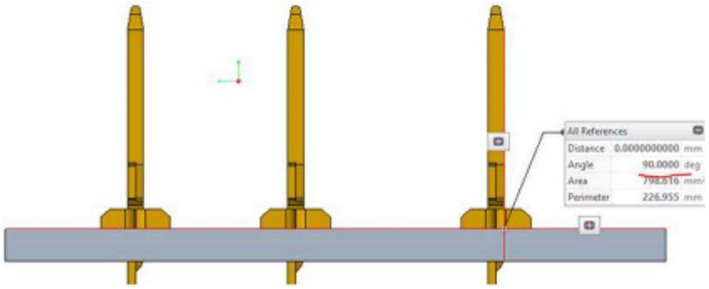


Figure 5

c. For connector insertion force test, if the housing is 2792799-X, the 4 positions equal pitch holder should be used, TE internal 4 positions equal pitch holder refer to TCPN: 1-2232511-7.

For customized requirement, specific holder should be used, but different holder should have different value of insertion force.

6. REFERENCE PART NUMBER

Here listed available part number for reference

PN	Description
2379911-X	250 FSPRING REC. 18-14AWG TPBR
2379907-X	250 HSG REC. F-SPRING 10MM 8MM 3P
2380041-X	250 HSG. F-SPRING REC 10MM 8MM 4P
2792799-X	250 HSG. F-SPRING REC. 10MM 4P NAT.

Note: 'X' means to dash number 1-9, means different packaging, restrict sales, and other non-Fit, Form, Function difference.

Compatible Reference:

Housing	Terminal
2379907-X	2379911-X
2380041-X	
2792799-X	