MEMO

Date	25th of June 2019	**Ref**	ESA-TECMSP-MO-006249
From	Carole Villette	**Visa**	T. Rohr Digitally signed by Thomas Rohr Date: 2019.06.25 11:07:54 +02'00'
To	Assembly Approved line, ESA PA Managers, ESA skills training school, ESA recommended microsectioning facilities	**Copy**	G. Corocher, J. Hokka, E. Peraud

Subject: Solderless assembly verification

1. Introduction

Solderless connection assemblies are not covered by any ECSS standards but will be included in the ECSS-Q-ST-70-61, currently being drafted. It has recently been identified by ESA that such assemblies are used on flight boards without assembly verification being performed or assembly verification being performed in compliance with the ECSS-Q-ST-70-38 that is out of scope for such connections.
This memo is issued for clarification until release of ECSS-Q-ST-70-61, to provide requirements to users to verify the reliability of the solderless connections.
The memo does not apply to press fit connections due to the possible damage in the PCB that is not evaluated within this test requirement.

Solderless assembly configurations shall be reviewed in the assembly MPCB by considering them as interconnections. In order to do such, the use of solderless connections shall be identified and solderless connections (e.g. connectors, ...) and shall be added to the list of parts required by the ESA memo ESA-TECQTM-MO-1931.

2. Verification test programme

a. The verification tests shall be performed on representative assembly configuration and under electrical monitoring when identified in the test flow.
b. The PCB built up and material shall be identical to the flight hardware as well as its plating and pad connection to the inner layer.
c. The verification tests shall be performed in order to show absence of degradation within the solderless interconnection part, PCB and component during all ground and in-orbit mission.

NOTE: Possible degradations can be creeping of the spring, fretting degradation of the contacts

d. 6 (six) parts shall be assembled with the same mechanical configuration as the flight model.

e. Mate-demate number shall permit to cover the application requirement with a margin of 4 in compliance with Table 4-4 of ECSS-E-ST-33-01.

f. Minimum vibration levels shall be in compliance with ECSS-Q-ST-70-08 requirements.

g. Shock test shall cover project requirements.

h. Electrical monitoring shall be applied during mechanical tests, vibration and shock when equipment is functional during launching phases.

i. Number of thermal cycles shall be 500, under electrical monitoring, providing it is sufficient to cover the mission with margin of 2 (two). The calculation shall be performed using the Norris Landzberg model ($AF=[\Delta T_l/\Delta T_f]^{1.9}$ $(f_f/f_l)^{1/3}$ exp $(1414\{(1/Tmax_f)-(1/Tmax_l)\})$.

NOTE: Mission includes ground and flight environment

j. Damp heat test shall be performed for all applications in compliance with Table 5-2 of ECSS-Q-ST-70-14.

k. In case of long-term storage application, project specific requirements may apply instead of requirement j.

l. Electrical continuity test shall be performed to verify absence of degradation of the connection after damp heat test.

m. Life test shall be performed for 2000 hours at 125 °C or at maximum storage temperature to evaluate the spring reliability under electrical monitoring.

n. The supplier may waive requirement m providing a representative test has been performed by the manufacturer.

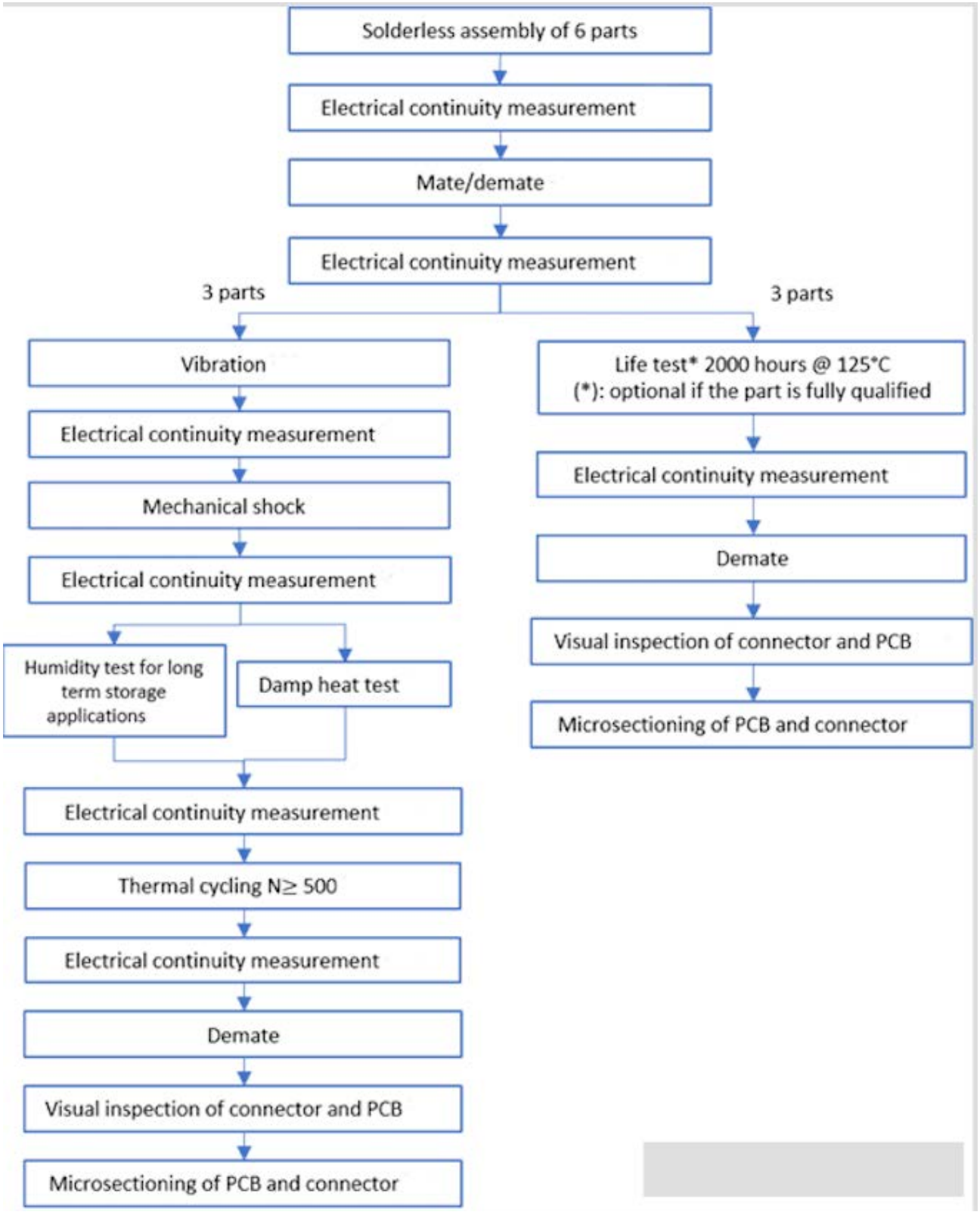
o. Visual inspection criteria shall apply to connector, component and PCB to demonstrate absence of damage of the plating and PCB.

NOTE: degradation could be due to creep of the spring, degradation of the contact due to fretting or cold welding

p. Microsections of connector, component and PCB shall be done in order to verify absence of plating damage and PCB damage. Cracks in the plating, delamination, missing plating shall be considered as a failure.

q. It is recommended to perform DPA of spare connectors to confirm absence of damage within the connector prior to start the test. Damage of the plating may occur in the barrel that has a section reduction to avoid the pin to exit from the connector. Such cracks may be due to the use of a not appropriate nickel plating.

In order to assess the degradation mode and to ensure reliability of the assembly the following test sequence is required:


Solderless assembly of 6 parts
Electrical continuity measurement
Mate/demate
Electrical continuity measurement
3 parts
3 parts
Vibration
Electrical continuity measurement
Mechanical shock
Electrical continuity measurement
Humidity test for long term storage applications
Damp heat test
Electrical continuity measurement
Thermal cycling N≥ 500
Electrical continuity measurement
Demate
Visual inspection of connector and PCB
Microsectioning of PCB and connector
Life test* 2000 hours @ 125°C
(*): optional if the part is fully qualified
Electrical continuity measurement
Demate
Visual inspection of connector and PCB
Microsectioning of PCB and connector

3. Electrical continuity measurement

a. Electrical continuity shall be measured with a daisy chained component including 100 % of the component connections.

b. Electrical monitoring of the daisy chain shall be performed during the 500 thermal cycles.

c. The electrical monitoring shall be continuous throughout all 500 cycles.

d. The sampling time of the electrical measurement shall be maximum 10 s throughout the 500 cycles.

NOTE: Different electrical monitoring methods can be agreed with the Approval Authority

e. The maximum increase of each individual daisy chain resistance, across the entire temperature cycling range during 500 thermal cycles, shall not be more than 10 % of initial resistance recorded during the first 5 (five) cycles.

f. No interrupts in the electrical monitoring shall be detected throughout the thermal cycling.

g. The supplier may provide their own criteria for an electrical failure to Approval Authority for approval.