1. (normative)  
   Source control drawing for photovoltaic assembly (SCD‑PVA) ‑  DRD
   1. DRD identification
      1. Requirement identification and source document

This DRD is called from ECSS-E-ST-20-08, requirement 5.2b.

* + 1. Purpose and objective

The source control drawing for photovoltaic assembly (SCD-PVA) contains the specific project dependent requirements, and together with this Standard, which contains the general requirements, constitutes the whole set of requirements for the qualification and acceptance of photovoltaic assemblies.

The SCD-PVA can be produced as a standalone document or as part of a system-level specification document.

The information on traceability to high level requirements can be included in the SCD-PVA itself or in the requirements traceability in the design justification file (DJF, see ECSS-E-ST-10). In either case a cross reference is made.

The SCD-PVA is a major input to the qualification plan.

* 1. Expected response
     1. Scope and content

Introduction

The SCD-PVA shall contain a description of the purpose, objective, content and the reasons prompting its preparation.

Applicable and reference documents

The SCD-PVA shall list the applicable and reference documents to support the generation of the document.

Terms and definitions, abbreviated terms and symbols

The SCD-PVA shall include any additional definition, abbreviation or symbol used.

Deviations from ECSS-E-ST-20-08

In conformance with clause 5.2, the SCD-PVA shall include the description and justification for any deviation in the in-process, acceptance and qualification tests.

Qualification test coupons

In conformance with clause 5.5.1.3.3, the SCD-PVA shall include the following:

In conformance with clause 5.5.1.3.3, the SCD-PVA shall include the front and rear side drawings of each qualification coupons with physical dimensions and including tolerances.

In conformance with clause 5.5.1.3.3, the SCD-PVA shall include the number of repaired cells to be included on each qualification coupon.

In-process tests

Mass measurement

The SCD-PVA shall state the maximum value of the mass of the coupon, in g, obtained from the mass measurement specified in clause 5.4.3.2.

Wet insulation

In conformance with clause 5.4.3.3, the SCD-PVA shall state:

The test voltage, in V.

The fluid to use.

The minimum value for the wet insulation, in MΩ.

1. 1 The fluid used is normally ethyl or isopropyl.
2. 2 A usual value for the wet insulation is 100 MΩ.

Adherence to substrate

In conformance with clause 5.4.3.4, the SCD-PVA shall state the minimum flatwise tensile strength, in N.

In conformance with 5.4.3.4b.1(b), the SCD-PVA shall state the required curing duration of the adhesive to bond the solar cells specified in 5.4.3.4b.1(a).

In conformance with 5.4.3.4b.2(b) the SCD-PVA shall state the required curing duration of the adhesive to bond the two Kapton foils specified in 5.4.3.4b.2(a).

In-process visual inspection

In conformance with clause 5.4.3.5, the SCD-PVA shall state the visual inspection procedure.

In-process continuity

In conformance with clause 5.4.3.6, the SCD-PVA shall state the maximum value of the resistance, in Ω.

Qualification tests

Fatigue thermal cycling

In conformance with clause 5.5.1.3, the SCD-PVA shall state the following:

The following test conditions:

the number of cycles to perform;

the temperature limits, in °C.

For the acceptance criteria:

the maximum variation of IOP, in %,;

the minimum insulation, in MΩ.

Humidity

In conformance with clause 5.5.1.4, the SCD-PVA shall state:

The chemical contents, type and % in the mist, to be added to the humid environment when there are specific requirements on the contents of the environment and the voltage bias conditions to be applied to the PVA.

For the acceptance criteria:

the maximum variation of IOP, in %,;

the minimum insulation, in MΩ.

Erosion of materials

In conformance with clause 5.5.1.6, the SCD-PVA shall state the test sequence, test definitions and requirements for the erosion of materials test.

EMC

In conformance with clause 5.5.1.7, the SCD-PVA shall state the test sequence, test definitions and requirements for the EMC test.

Definition of tests and checks

Add-on mass

In conformance with clause 5.5.3.1, the SCD-PVA shall state the maximum add-on mass of the coupon, in g, obtained from a mass measurement.

Full visual inspection

The SCD-PVA shall state:

The maximum number of cell cracks on the coupons (in conformance with requirement 5.5.3.2.8a.1).

The maximum number of gridlines that a cell crack can cross (in conformance with requirement 5.5.3.2.8a.2).

The inspection criteria for solar cells on substrates (in conformance with clause 5.5.3.2.5).

Electrical health

For electrical continuity check, in conformance with clause 5.5.3.3.2, the SCD-PVA shall state the following conditions for checking the continuity of the strings:

current to be applied, in A, or voltage to be measured, in V.

specified illumination to performed the measurement.

For insulation resistance, the SCD-PVA shall state the minimum insulation resistance, in MΩ, at a test voltage specified in V, for the configurations specified in clause 5.5.3.3.3.

For grounding spot resistance, in conformance with clause 5.5.3.3.4, the SCD-PVA shall state:

The maximum value, in Ω, of the resistance of bleed resistor lead (+) to substrate (-).

The maximum value, in Ω, of the grounding spots (+) to substrate (-).

For bleed resistor test, in conformance with clause 5.5.3.3.5, the SCD-PVA shall state the range of values, in kΩ, of the bleed resistor.

For blocking diode test, in conformance with clause 5.5.3.3.6, the SCD-PVA shall state:

The IFORWARD in A, and the VREVERSE in V, of the blocking diode.

The values for VFORWARD, in V, and IREVERSE, in A, to be obtained from the test.

For shunt diode, in conformance with clause 5.5.3.3.7, the SCD-PVA shall state:

The IFORWARD, in A, to be used, and the maximum drop of forward voltage, in V, per cell, to be obtained from the test.

The test method to be used.

The maximum temperature, specified in C.

For thermal sensor test, in conformance with clause 5.5.3.3.8, the SCD-PVA shall state:

The resistance of the thermal sensor as a function of the temperature.

The range of resistance to be obtained from the test, in Ω.

1. A reference to a calibration table, included in the SCD, can be used.

For resistance measurements, in conformance with clause 5.5.3.3.9, the SCD-PVA shall state the maximum value of the resistance, in Ω, between the (+)/(+) and   
(-)/(-) ends of the harness.

Electrical performance

In conformance with clause 5.5.3.4.2, the SCD-PVA shall state the following values, together with their inaccuracies, recalculated to 25 C, for 1 S.C. (AM0) (as defined in clause 10), providing the test voltage VOP range (specified in V), and the temperature range (specified in C):

the nominal value of the IOP,MIN, in A;

the nominal value of VP,MAX., in V;

the nominal value of VOC, in V;

the nominal value of IP,MAX, in A;

the nominal value of ISC, in A.

Capacitance

In conformance with clause 5.5.3.5, the SCD-PVA shall state a procedure to measure the capacitance, including the test temperature (average operational temperature).

Bake-out

In conformance with clause 5.5.3.6, the SCD-PVA shall state: the test conditions, as a combination of time and temperature.

Acceptance thermal cycling test

In conformance with clause 5.5.3.7, the SCD-PVA shall state:

The following test conditions for the tests specified in clause 5.5.3.7:

The number of cycles to perform.

The temperature limits, in C.

For the acceptance criteria:

The maximum increment of IOP, in %.

The minimum insulation, in MΩ.

Reflectance

In conformance with clause 5.5.3.8, the SCD-PVA shall state the maximum reflectance change, in %, for the following wavelength bands:

λ ≤ 300 nm;

300 nm < λ < 900 nm;

900 nm< λ < 1 800 nm.

Transmission

In conformance with clause 5.5.3.9, the SCD-PVA shall state the acceptance criteria for the change in transmission due to contamination in the band of 280 nm < λ < 2 500 nm.

X-ray

In conformance with clause 5.5.3.9, the SCD-PVA shall state the acceptance criteria, for the integrity of:

busbars,

wire collection strips, and

diode boards.

Substrate integrity

In conformance with clause 5.5.3.10, the SCD-PVA shall state:

The test method, either airscan, or C-scan, or destructive test, for the integrity of the skin to honeycomb.

The acceptance criteria.

Vacuum thermal cycling

In conformance with clause 5.5.3.11, the SCD-PVA shall state the maximum acceptable degradation, as follows:

The maximum increment for IOP, in %.

The minimum insulation, in MΩ .

* + 1. Special remarks

None.