BiSon64-ET-B Sun Sensor

Interface Control Document

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Abbreviations

AD	Applicable Document
BOM	Bill Of Material
COTS	Commercial Of The Shelf
CSS	Coarse Sun Sensor
ECSS	European Cooperation for Space Standardization
ESA	European Space Agency
FOV	Field Of View
FSS	Fine Sun Sensor
IC-Doc	Interface Control Document
IC-Drw	Interface Control Drawing
LOS	Line Of Sight
NTC	Negative Temperature Coefficient resistor (thermistor)
RD	Reference Document
TRR	Test Readiness Review

Applicable Documents

AD	Document title	Document number	Issue
AD-01	BiSon64-ET-B product specification	15-LRD-SP-0006	4
AD-02	BiSon64-ET-B Interface Control Drawing	150T701	04
AD-03	Precision fastener	500M085	01
AD-04	Washer vented	500M086	01

Reference Documents

RD	Document title	Document number	Issue
RD-01	Space engineering Interface management	ECSS-E-ST-10-24	C
RD-02	BiSon64-ET(-B) Delivery-Packing-Storage-Handling and Transportation procedure	19-LRD-PR-0052	1

1 Introduction

The BiSon64-ET-B sun sensor, see Photo 1, is a high reliability sunsensor with a nominal field of view of 64 degrees in diagonal which is specifically designed for satellite applications. This version is an extended temperature (-ET) version of the standard BiSon64-B, whereby the higher temperature range is obtained through using different materials with as good as possible matching temperature coefficients of extensions and a glue specifically designed for this application. The straylight baffle is added for demanding satellite applications.

Photo 1 BiSon64-ET-B

This document specifies the interfaces for the BiSon64-ET-B sun sensor and shall be read in conjunction with the interface control drawing [AD-02]. And is written in line with the ESA Space engineering Interface management ECSS-E-ST-10-24 C [RD-01].

2 BiSon64-ET-B Interface data

2.1 Electrical

2.1.1 Grounding and insulation

- The resistance from the common ground is identified by “R2” as mentioned on [AD-02] sheet 3.
- Resistance “R2” to case shall be 1MΩ<R<10MΩ as mentioned on [AD-02] sheet 3.
- The capacitance between the sensor and ground shall be <100pF.

2.1.2 Signal interface data

2.1.2.1 Diode signal

- The sensor is identified by “D1” as mentioned on [AD-02] sheet 3.
- Sensor “D1” will generate 4 currents.
- Signal type of “D1” is analogue.
- Signal function of “D1” is measurement.
- Circuit diagram is mentioned on [AD-02] sheet 3.
- When illuminated with a 1AM(0) light source the generated currents on the diode outputs with respect to the diode return will be -1.45mA ±60% at normal incidence over the full temperature range.

2.1.2.2 Thermistor signal

- The internal thermistor is bipolar and identified by “R1” as mentioned on [AD-02] sheet 3.
- Thermistor “R1” has a nominal value of 10kΩ ± 1% @ 25°C.
- The material constant B of the thermistor will be 3930K ± 1%.
- T1=25°C and T2=50°C.

$$B_{(\mathrm{T1/T2})} = \frac{T2 \times T1}{T2 - T1} \times \ln\left(\frac{R1}{R2}\right)$$

- Where:
  - B value (material constant).
  - T1 is the first temperature point in Kelvin.
  - T2 is the second temperature point in Kelvin.
  - R1 is the thermistor resistance at temperature T1 in Ohms.
  - R2 is the thermistor resistance at temperature T2 in Ohms.

2.1.3 Harness interfaces

For the below paragraphs (as per [RD-01]) polarity indicators are defined as:

- B=bipolar
- R=return
- P=positive
- N=negative

2.1.3.1 Connector interface data – per pin

The connector, identified as "J1" on [AD-02] sheet 3, is a 7 pin female connector for which the pins are identified as follows:

PIN number	Component	Output		Function	Polarity
		signal	type		
J1-1	R1-1	Thermistor	Analogue	Measurement	B -bipolar
J1-2	R1-2	Thermistor	Analogue	Measurement	B -bipolar
J1-3	Q2	Diode	Analogue	Measurement	N -negative
J1-4	RTN	Diode return	Analogue	Measurement	N/A
J1-5	Q3	Diode	Analogue	Measurement	N -negative
J1-6	Q4	Diode	Analogue	Measurement	N -negative
J1-7	Q1	Diode	Analogue	Measurement	N -negative

2.2 Optical

The optical interfaces are defined by means of a right-hand orthogonal coordinate system defined by the X axis running through the center of the reference hole (right side bottom hole "z" on sheet 1 of [AD-02]) and the slotted hole. Consequently, the Z axis is defined orthogonal to the mounting plane of the sensor.

Sheet 2 of [AD-02] defines the fields of view of the sensor with respect to the mounting plane in cross sections A-A, B-B and C-C. For each of these cross sections there are two fields of view given for which the smaller one is the measurement field of view and the larger one is the Sun exclusion field of view.

Within the specified measurement field of view the defined accuracies will be obtained after the appropriate calibration compensation.

Outside of the specified Sun exclusion field of view, the sensor will not be sensitive to Sun light.

More applicable information:

- The Field of View is mentioned on [AD-02] sheet 2.
- Outside optical coating is an ITO coating.
- The first inside optical coating is a reflection coating.
- Outside mechanical surface finisher is not applied as mentioned on [AD-02] sheet 4.
- The inside mechanical surface of the baffle is a black anti-reflection coating as mentioned on [AD-02] sheet 4.

2.3 Thermal control

- Baseplate thermal contact area are mentioned as “grounding studs” on [AD-02] sheet 4.
- Temperature range is mentioned in [AD-01].
- Contact area flatness is mentioned on [AD-02] sheet 1.
- Overall roughness Ra is 1.6µm according to DIN ISO 1302 as mentioned on [AD-02] sheet 1 up to 5.
- Thermal design of the mounting interface shall be such that the temperature is kept within the specified temperature ranges at the sensor side of the TRP as indicated on [AD-02] page 4 through conduction.
- The housing is made of bare ASTM grade V Titanium as mentioned on [AD-02] sheet 4.
- The window has a measured α of 0.56
- The window has a measured ε of 0.76
  Thermal mass of the sensor is 17.07J/°C ±5%

2.4 Structural

In order to achieve the specified accuracy and environmental withstanding capability.

- Precision fastener 500M08501 [AD-03] shall be used.
- Specified precision fasteners shall be fastened with the recommended specified torque of 1Nm ±10%.

In order to avoid entrapment of air slowing evacuation.

- Washer vented 500M08601 [AD-04] can be used.
- The approximate position of the 1mm venting is indicated on [AD-04].

More applicable information:

- The reference hole is identified by “Temperature Reference Point” as mentioned on [AD-02] sheet 1.
- The reference hole is Ø4H7.
- Envelope dimensions are mentioned on [AD-02] sheet 1.
- Mass in mentioned on [AD-02] sheet 1 up to 5.
- Centre of gravity is identified by “COG” as mentioned on [AD-02] sheet 1.
- Calculated Moment of inertia are mentioned on [AD-02] sheet 4.
- Mounting holes size and location are mentioned on [AD-02] sheet 1.
- Mounting pads thickness are mentioned on [AD-02] sheet 1.

- Geometrical tolerance is mentioned on [AD-02] sheet 1.
- Venting holes position are indicated on [AD-2] sheet 4.
- Venting holes are 1mm diameter.
- Venting holes shall be kept free of any coverage and or blocking particles.
- Connector location is mentioned on [AD-02] sheet 1, position: (I – 3/4).
- Grounding studs are mentioned on [AD-02] sheet 4.
- The mutually flatness studs are mentioned on [AD-02] sheet 1.
- Overall roughness Ra is 1,6µm according to DIN ISO 1302 as mentioned on [AD-02] sheet 1 up to 5.
- Sensor mounting method can be found in [RD-02].

2.5 Mechanisms

- Protection cover outside dimensions are mentioned on [AD-02] sheet 5.
- Protection cover material is POM as mentioned on [RD-02] sheet 5.
- Protection cover mounting holes size and location are mentioned on [AD-02] sheet 5.
- Mounting hardware delivered with the protection cover:
    - Screw specification is according to DIN912 A2-70 M4*16.
    - Washer specification is according to DIN433 A2-140 HV M4.
- Mass of protection cover including mounting material is <47gr.

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