Solar Orbiter: SPICE

SPICE GSE internal TQCM Requirement Specification

Issue 1.0

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CHANGE LOG

Date	Issue	Revision	Pages	Reason for change
21 Apr 2016	0	1	All	New document created.
27 Apr 2016	1	0	All	Edits for release.

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1. INTRODUCTION

1.1 Scope

The scope of this document includes TQCM sensors to be used in the SPICE PFM and FS instruments for GSE testing to verify the cleanliness of the SOU before delivery.

1.2 Purpose

This document provides the tender case for provision of these off-the-shelf items.

1.3 Applicable Documents

AD #	APPLICABLE DOCUMENT TITLE	DOCUMENT ID	ISSUE
1			
2			
3			

Table 1-1: Applicable Documents

1.4 Reference Documents

RD #	REFERENCE DOCUMENT TITLE	DOCUMENT ID	ISSUE
1			
2			
3			

Table 1-2: Reference Documents

1.5 Abbreviations and Definitions

Abbreviation	Definition
GSE	Ground Segment Equipment
TQCM	Thermoelectric Quartz Crystal Microbalance

2. SPICE GSE INTERNAL TQCM

The SPICE instrument must meet a high level of cleanliness due to the sensitive optics within the system. In order to verify to the customer, ESA, that the SPICE instrument meets these cleanliness levels one TQCM sensor is needed for each of the PFM and FS models of the instrument as well as GSE TQCM controller to take readings from these TQCMs on ground. Harness between the sensors and controller are not needed, as these have been made specific for the SPICE instrument setup.

Because the testing the PFM and FS units of the instrument undergo, the TQCM units must be vacuum compatible. Standard documentation of testing to verify build quality and full functionality is to be delivered with the items.

2.1 SPICE GSE Internal TQCM Requirements

Requirement	Comments (customer or supplier)
The supplier shall provide 2 GSE TQCM sensors.	
The supplier shall provide 1 GSE TQCM controller.	
Each TQCM sensor shall fit within a volume of 25mm x 25mm x 25mm.	
Each TQCM sensor shall have a mass less than 30 grams.	
Each TQCM sensor head peltier power load, to the system it is mounted on, shall be less than 2W.	
Each TQCM sensor head shall use a supply voltage of 8-12 VDC from the controller.	
Each TQCM sensor output beat signal shall have a frequency be between 1 Hz and 650 KHz with an amplitude between 6–10V.	
The crystal frequency for each TQCM sensor shall be 15 MHz.	
The mass sensitivity of each TQCM sensor shall be greater than 3x10^8 Hz.gram^{-1}.cm^{2}.	
The dynamic range of each TQCM sensor shall be greater than 2x10^-5 grams.	
The operating temperature range to the TQCM sensors shall be -25° to 100°C.	
The operating pressure range of the TQCM sensors shall be ambient to hard vacuum.	
The TQCM controller shall have a temperature measurement resolution of 0.01K and accuracy of 0.25K absolute and 0.1K relative.	
The TQCM controller shall have a frequency range of 1 to 600 KHz.	
The TQCM controller shall be compatible with mains power supplied at 240V, 50Hz, through an IEC connector.	
The TQCM controller shall have a standard interface for connecting to each TQCM sensor individually.	Interface details pin-out/connector types to be provided.
The supplier shall provide reports for standard testing used to verify build standard and full functionality.	Supplier to provide a list of standard testing and documentation in response to this tender.

Table 2-1: SPICE GSE Internal Requirements.