MTG Optical Ground System Equipment Transport and Storage Containers Specification

Document Number: MTG-STFC-IBLBO-RS-0003
Document Category: I
Issue: 03
Date: 28/08/2018
Classification: Commercial in Confidence
PT Code: I12K340/ S12KC6

Document Prepared By:	Sandy Fok Jane Hurley Elliot Newman	Signature and Date:	Digitally signed by Elliot Newman Date: 2018.08.28 16:18:43 +01'00'
Project Manager:	Brittany Robson (Project Manager)	Signature and Date:	Digitally signed by Brittany Robson Date: 2018.08.28 16:36:28 +01'00'
PA Manager	Alice Cantell-Hynes (PA Manager)	Signature and Date:	Digitally signed by Alice Cantell-Hynes Date: 2018.08.29 09:12:58 +01'00'
Customer Approval:		Signature and Date:	

Change Record

Issue	Date	Section(s) Affected	Description of Change/Change Request Reference/Remarks
01D01	19/09/2017	All	Initial draft
	13/10/2017		Updated with requirement for externally accessible desiccant cartridge for the outside container
			Corrected to two He systems (not three)
			Added skate for phase separator system
			Added spreader frames to contents of TSC 1,3 and 4
01D02	24/10/2017	1	Requirements matrix moved to before requirements
		2	Changed each TSC to subheading
		2	Changed wording of notes
		0	0 humidity indicator requirement simplified
		0	0 lifting points for inner container requirement removed for TSC#2
		0	0 updated with legible distance
		0	Removed duplicate notes that are already in Section 2
		0	Added TSC# column and updated Spares
	13/11/2017	2	Lifting equipment (spreader frames) now contained in TSC#2
		0	0 – added "exposed" to requirement
	21/11/2017	1.1	Corrected the electronics and He flange to one combined flange
		1	Wire-rope isolator requirement removed for EGSE cabinet
		0	Rain-proof covers used in conjunction with water-resistant container now acceptable
	21/02/2018	1.3	Updated applicable documents
		All	Updated document reference numbers
	07/03/2018	4.1	Updated spares list
	08/03/2018	0	Spreader frames moved to TSC#2
01	15/03/2018	0	0 – Added "and support"
		0	0 – Added "in accordance to industry standard"

	16/03/2018	2	Updated description and image to include mounting platform
			0 updated to include mounting platform
		0	Added "and associated equipment"
	19/03/2018	1.1	Corrected to "Firm Fixed Price"
			n/a added to cells
		1	Green hashed cells changed to yellow for clarity
			Clarified bag to be zipseal
		2	Added nitrogen top-up requirement
			Changed wording of inner bags from "must be"
		0	to "can be" for clarity
			0 20 cycles, painted white externally
		0	0 "box" and "cover" replaced with "base" and "lid"
			0 reworded and dimensions changed
			0 reworded
			0 updated shock indicator requirement
			0 "non-shedding" added
			0 "attachment slings" replaced with "tie-down straps"
			0 expanded
			0 "rotating" replaced with "castor"
			0 added
			Figure 2-1 removed heat seal
	20/03/2018	2	0 requirements divided for TSC#4
		0	0 removed still forklift
			Released
	26/03/2018	All	
02D01	24/05/2018	4.1	Added envelope, delicate and in-foam/mounted columns
		3	Explicit detail added about dirty vs clean for outer/inner container, materials acceptable, what inner container is meant to consist of, and typical use of TSC. An indication as to the value/importance of each TSC's contents given.
		R-9	ISO 8 filtering not mandatory for outside container
		R-26	No shock-mounted wheels
		5.4	Dates updated

02D02	08/06/2018	2 0 0 0 0 0	Updated outside container requirement R-9 Updated filtering requirement R-20 Note added regarding use of timber Clarified CE marking required for full system and components "where applicable" Added image to show available mounting points of BB Clarified spreader frames are assembled
02	12/06/2018	0,0,4.1 4.1 All	Reduced to one spreader frame Updated pipework lengths Issued
03	21/08/2018	Sections 2,3,4,5,6	Old sections 2, 3 and 4 merged to form Section2: TSC Overview and Section3: Requirements. Very little change to information inside document. Note new information on bagging. Section 5 and 6 combined into section 4. New section maintains definitive list of all components to be transported and stored. Note: bagging of components in container 4 is now TBC.

Distribution List

Distribution	Company	Name
x	ESA	MTG Team
x	TAS-F	MTG Team
	OHB	MTG Team

TABLE OF CONTENTS

1 Introduction

1.1 Purpose

STFC is designing and building five blackbody targets for the calibration of two instruments on the ESA Meteosat Third Generation (MTG) imaging and sounding satellites. The two instruments are called 'IRS' (being developed by OHB in Germany) and 'FCI' (being developed by Thales-Alenia Space in France). The blackbody targets require very accurate thermal control, based on a liquid nitrogen jacket, a helium gas gap (where heat conduction through the gas is controlled by adjusting its pressure), and electric heaters. These, together with associated electronics, controls, tooling, flanges, harnesses, and cryogenic supply systems and their ancillary pipework, form the Optical Ground System Equipment (OGSE).

This contract is for the transport and storage containers (TSC) for TAS-F only, but it is likely the OHB containers will follow with similar requirements.

For TAS-F, this will consist of

- two blackbodies
- one phase-separator
- two Helium supply systems
- associated pipework for two blackbodies
- harnessing for two blackbodies
- one electronics/He flange
- one LN2 flange
- one EGSE cabinet
- a transformer
- two assembly frames
- three mounting/alignment frameworks.

The OGSEs will be transported from STFC to TAS-F where they will be intermittently in use and in storage over a 25 year timespan.

In bidding for this ITQ, the Bidder is asked to provide for the TAS-F calibration rig and associated equipment:

- **A Firm Fixed Price (FFP)**
- **A technical proposal showing the preliminary solution for each of the containers.**
- **A Schedule and Workflow plan, highlighting kick-off, design phases and reviews, and deliveries of containers.**

1.2 Scope

This document describes the requirements for the dual-purpose transport and storage containers in which all TAS-F components of the OGSE are housed.

1.3 Applicable Documents

The below documents are provided on
https://drive.google.com/drive/folders/1slo6s9P6TTlDtwDU9dCx1-CnSftzB_wp?usp=sharing

AD #	Document #	Title
AD1	**KE-0269-503**	TAS-F VBB & DSBB Base Frame Assy Model
AD2	**KE-0269-1430**	TAS-F VBB & DSBB Ball Transfer Unit Model
AD3	**KE-0269-500**	Lower BB (DSBB) Assembly Model
AD4	**KE-0269-511**	Upper BB (VBB) Assembly Model
AD5	**KE-0269-536**	LN2 Assy Frame Model and Drawing
AD6	**KE-0269-537**	BBM Cavity Assy Frame Model and Drawing
AD7	**PPS10100**	Helium System Model
AD8	**PP S10 100**	Helium System Drawing
AD9	**PP S10 103**	Helium System (Simplified) Drawing
AD10	**MANUAL CMT20K-151-1_pages8-13**	Transformer Drawings
AD11	**KE-0269-1305**	Phase Separator Model
AD12	**KE-0269-1456**	Phase Separator Feedthrough Model
AD13	**P1-22103**	FLANGE ASSEMBLY FOR TAS-F CHAMBER Drawing (Phase Separator Feedthrough)
AD14	**P3-22107**	EXHAUST PIPE ASSEMBLY – TAS-F CHAMBER
AD15	**P1-22001**	Phase Separator Level Probe Assy. Drawing
AD16	**KE-0269-1100**	TASF TVAC DN500 MLTAIT553A_615 Assy

1.4 Reference Documents

The following documents, although not a part of this document, amplify or classify its contents. The below documents are provided on
https://drive.google.com/drive/folders/1slo6s9P6TTlDtwDU9dCx1-CnSftzB_wp?usp=sharing

IR #	Document #	Title
RD1	MTG-STFC-IBLBO-DD-0001	MTG OGSE Lot 1 Design Document

2 Transport and Storage Container Overview

The OGSE will be transported and stored in bespoke transport/storage containers (TSC) suitable for both purposes.

These will be doubled-sealed containers, consisting of

- an **'outside container'**: a **protective dirty hard container** (constructed of whatever material the bidder deems appropriate given all other requirements)
  NOTES:
  - *Water-resistant (as opposed to waterproof, whereby water-resistance is defined as being able to withstand standing in light rain for a short period of time without penetration of the container – so non-permeable materials with limited fixing points) outer containers are preferred, as are options relying on soft covers to increase this resistance.*
  - *Shock resistance is to be limited to the inner container wire rope isolators; i.e. no shock mounting on castors.*

followed by

- an **'inner container'** which ultimately contains the OGSE: this 'inner container' consists of **a set of two nested air-tight, re-sealable bags**, such that
  - the first, an **outer bag: a metalised ISO 8** compatible moisture barrier bag
  - the second, an **inner bag: an ISO 5 clean** bag (note: multiple inner bags can be contained in one outer bag)

  in between which there is desiccant cartridge with a moisture warning indicator, and with the inner bag resting on a set of mounts/rails (ISO 5 compatible) which acts to both hold the bagged assembly in place and to provide lifting interfaces. These nested bags will be attached to a mounting platform that is mounted on a wire rope isolated shipping frame (see Figure 2-1).

  The ISO 5 bags do not need to be manufactured in a clean environment but must be cleanable to ISO5 standards.

  NOTES:
  - *Not all containers require mounting system with wire rope isolation, these are marked in the requirements*
  - *Both the outer and inner bags are to be zipper (not toothed, but zipseal-like) metalised bags.*

The supplier is strongly recommended to provide a solution with bagging and the inner container included. Bids with bagging included will be preferred to bids without bagging.

They will normally be filled with dry nitrogen (not supplied by the Bidder) with the ability of topping up with dry nitrogen when necessary.

The envisioned use of these TSC is that the outer container will be used to protect the items enclosed in the inner container during transport and long-term storage; these will probably be shipped once from the UK to Europe, where they will spend most of their 25 year lifetime in storage. When in use:

1. they will be taken out of storage, transported to the testing facility,
2. taken out of the dirty outer container outside of clean areas,
3. moved into the cleanroom antechamber in the inner container,
    - where the (dirty) outer bag of the inner container will be removed,
    - leaving only the clean inner bag of the inner container (and its contents) to be moved into the cleanroom.

Available drawings and CAD models are included as applicable documents (Section 1.3) as PDFs and STEP files; in the case that a CAD model is unavailable (e.g. COTS part), the xyz envelope and mass are given. Please refer to Section 4 for a list of components associated with each TSC. Interfaces will be provided at Kick off for mounted parts.

All of the components described in this specification (inner container/outer container, various monitoring/relief devices etc) are deliverable as part of this contract and provided to STFC by the Bidder. If any of the components detailed within this specification cannot be provided, or if there are limitations, Bidders must list any such components or limitations along with their proposed solutions.

In particular, if Bidders are not able to provide the inner container bags, STFC will consider bids without the bags themselves included, but will need to have this explicitly noted, highlighting whether the mounts/rails/desiccant will be provided, as well as necessary interface requirement of the Bidder explicitly listed, and with a statement from the Bidder confirming that they will fully liaise with STFC and a third-party bagging supplier. Additional marks will be awarded to bidders who are able to provide the full inner container with bags included.

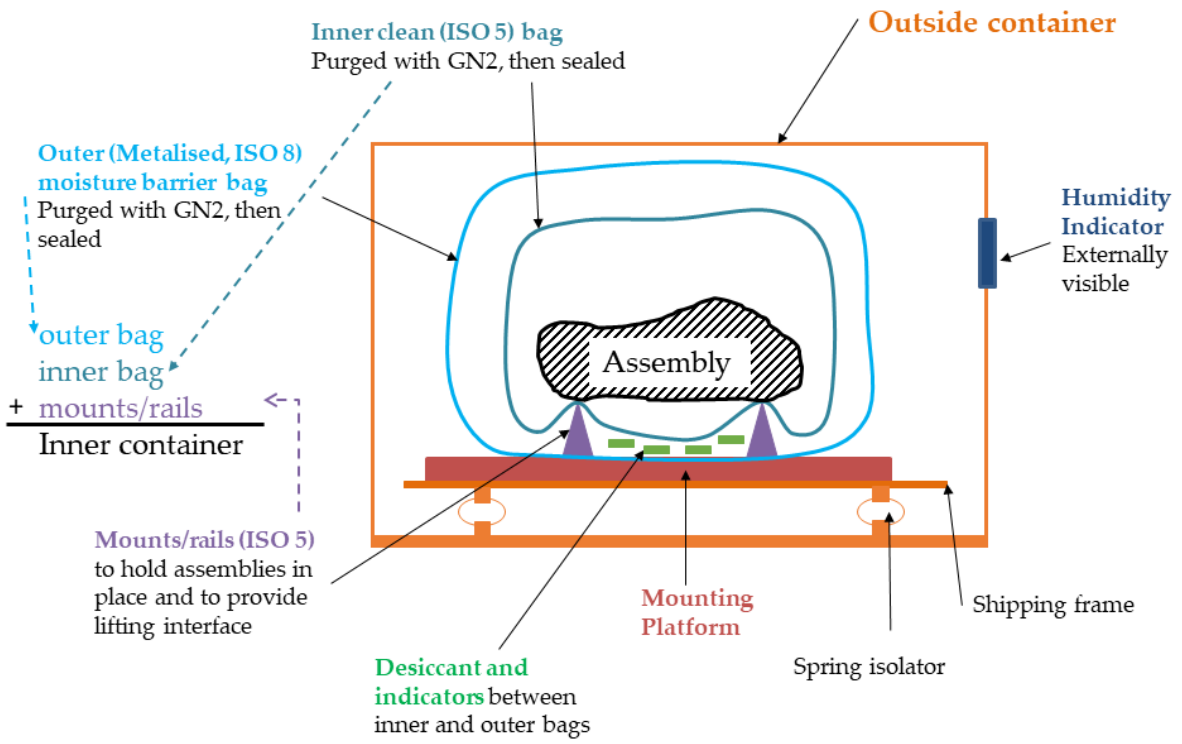


Figure 2-1 Transport/Storage Container (TSC)

3 Requirements

Some simplifications for specific containers are preferred as not all requirements need be applied to all TSCs; the overview of requirements to the various deliverable TSCs are shown below:

- If a requirement is marked with an 'X' and green shading, then the particular requirement is applicable to that particular TSC; but if cell is marked "N/A" the TSC does not require that particular feature. In some cases, key words are used instead of x's for clarity.
- As above, but if the cell is shaded yellow, the particular requirement is a nice-to-have, and the Bidder is asked to advise on the cost/complication aspects.

3.1 Transport and Storage concept description and contents

ID	Requirement	Container Validity X/(N/A)			
		TSC#1	TSC#2	TSC#3	TSC#4
R-1	The OGSE shall be transported and stored in bespoke transport/storage containers suitable for both purposes	X	X	X	X
R-2	The containers will be double sealed consisting of an outer and inner container. The outside container shall act as a protective dirty hard container (constructed of whatever material the bidder deems appropriate given all other requirements *Notes:* • *Water resistant (as opposed to waterproof, whereby water-resistance is defined as being able to withstand standing in light rain for a short period of time without penetration of the container – so non-permeable materials with limited fixing points)*	X	X	X	X

	outer containers are preferred as are options relying on soft covers to increase this resistance. • *Shock resistance is be limited to the inner container wire rope insulators; i.e. no shock mounting on castors.*				
R-3	The inner container shall contain the OGSE itself and consist of a set of two nested air-tight, re-sealable bags, such that: • The outer bag is a metalised ISO 8 compatible moisture barrier bag • The inner bag is an ISO 5 clean bag (note: multiple inner bags can be contained in one outer bag) In between the bags there shall be a desiccant cartridge with a moisture warning indicator, and with the inner bag resting on a set of mounts/rails (ISO 5 compatible) which acts to both hold the bagged assembly in place and to provide lifting interfaces. These nested bags will be attached to a mounting platform that is mounted on a wire rope isolated shipping frame (see Figure 2-1). *Notes:* • *The ISO 5 bags do not need to be manufacture in a clean environment but must be cleanable to ISO5 standards* • *Both the outer and inner bags are to be zipper (not toothed, but zipseal-like) metalized bags* • *TSC#4 does not require ISO 5 bags. ISO 8 is sufficient. Double bagging still required.*	**X**	**X**	**X**	**X**
R-4	The containers shall have a mounting system with wire-rope isolation	**X**	**N/A**	**X**	**N/A**
R-5	TSC#1 shall provisionally contain the following:	**X**	**N/A**	**N/A**	**N/A**

	• The assembled blackbody assemblies (of which there are two, to be put in separate inner (ISO5) and separate outer (ISO8) bags. Please note that they each are to be provided with desiccant cartridges (each with a moisture warning indicator), and with each inner bag resting on a set of mounts/rails (ISO 5 compatible) which acts to both hold the bagged assembly in place and to provide lifting interfaces) • Protective Covers • Mounting/alignment framework for the BBs				
R-6	TSC#2 shall provisionally contain the following: • accessories and tools for the blackbodies; • the disassembled assembly frames, • any ancillary tooling required for assembly/disassembly such as lifting plates; • one LN2 flange and one He/electrics flange, • the associated harnesses (in-air and in-vacuum), • the pipework (LN2 and He), • and spare components; • spreader frame and lifting equipment for blackbodies, He supply systems and transformer	**N/A**	**X**	**N/A**	**N/A**
R-7	TSC#3 shall provisionally contain the following: • Two He supply Systems • A phase-separator system • A transformer and its associated harnessing *NOTE 1: The inner-bags for the phase-separator system must be ISO 5 compatible for cleanroom use. All other items in this T&SC (He systems, and transformer/harnessing) can have inner-bags that are ISO 8 or better.*	**N/A**	**N/A**	**X***	**N/A**

NOTE 2: It is preferable for this TSC, but not required, that the 'outer container' have a "top-hat" which can be lifted off of the container base for handling purposes. This is so we don't have to lift the big/heavy He supply systems + the big/heavy transformer quite so high and far as would need to be done if they were to have to be lifted from the top of a 'standard' outer box. That said, if this is impracticable or much more expensive, it is not required, but rather a nice-to-have.

Figure 3-1: "Top-hat" container body which lifts off of container base.

R-8	TSC#4 shall provisionally contain the following: • Components of the EGSE, including the EGSE cabinet in its sully assembled state *NOTE 1: ISO 5 bags not required for inner bag. ISO 8 bags are sufficient.* *NOTE 2: If it is more convenient/cheaper for the transformer from TSC#3 to be placed in TSC#4, then this solution should be presented.*	**N/A**	**N/A**	**N/A**	**X**
R-9	TSC#4 shall be supplied with a ramp via which the contents of the container can be rolled out in a safe manner. This could be a folding door which folds on to the ground to form a ramp. The Bidder is to advise if there is an alternative solution (e.g. provision of ramp by the Bidder) which is simpler but functionally the same. If a separate ramp is provided, it would be appreciated if it could be used with TAS-F TSC#3 as well to roll the heavy items (max. 320kg) off the base. *NOTE 1: The customer has been informed regarding the conflict between bagging and wheeling of the equipment onto a ramp. Please provide an indicative cost of the ramp and this will be clarified during the tender.* *NOTE 2: For TSC#3 if the top-hat lid is provided (R-7) and has the correct lifting fixtures, a ramp is not required.*	**N/A**	**N/A**	**X**	**X**

3.1.1 Overall Design and Function

3.1.1.1 TSC Components: Inside and Outside Containers

ID	Requirement	Container Validity			
		TSC# 1	TSC# 2	TSC# 3	TSC# 4
R-10	Each TSC shall provide adequate protection from mechanical damage. Appropriate packing and support in the container shall mechanically fix the equipment	**X**	**X**	**X**	**X**
R-11	The 'outside container' of each TSC is a transport container. It shall • provide suitable mounting locations to support the 'inner container' • be light weighted, reusable (for at least 20 cycles), painted white externally. • provide suitable protection such that the OGSE and all associated equipment shall be able to be transported by road, sea or air by commercial facilities • have protection of the 12 edges against shocks (8 for the base and 4 for the lid), and protection for the closure devices/locks.	**X**	**X**	**X**	**X**
R-12	The 'inner container' shall be air-tight and consist of two nested sealed bags (not a hard container), the 'inner bag' and the 'outer bag'. It will allow for the possibility of evacuation during transport and a dry nitrogen atmosphere to be maintained during storage. It shall conform to CAA and FAA regulations, as the TSC may be transported by air.	**X**	**X**	**N/A**	**N/A**
R-13	The 'inner container' shall be capable of withstanding a pressure of 0.5psi above atmospheric conditions when configured for use as a storage container.	**X**	**X**	**X**	**X**

R-14	The 'inner container' shall be sufficiently large to allow it to expand and contract during transportation by air and thereby maintain a sealed environment during transportation, and must be able to survive a rapid decompression event when travelling in the pressurized hold of an aircraft to BS 88:1996. If Bidder is accustomed to working to a different standard, please advise. Air pressure to be considered in air transport: equivalent to 15 km altitude.	**X**	**X**	**X**	**X**
R-15	The inner and outer bags to be zippered and reusable.	**X**	**X**	**X**	**X**

3.1.1.2 Sealing

ID	**Requirement**	**Container Validity**			
		TSC#1	**TSC#2**	**TSC#3**	**TSC#4**
R-16	Each "inner container" must be purgeable with dry Nitrogen and seal suitably for long-term storage.	**X**	**X**	**X**	**X**
R-17	Each "Outer container" must be capable of 'breathing' during transportation by air Note: In the case that it costs <5% cost delta and <1 week difference in delivery time, the preference would be that the air drawn into the outer container must be filtered to ISO class 8. If otherwise, please do not design for filtering of air.	**X**	**X**	**X**	**X**

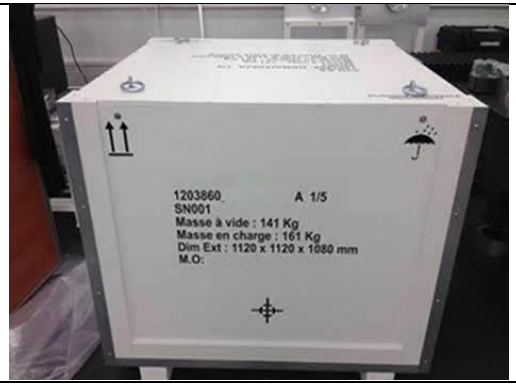
3.1.1.3 Volume and Mass

ID	**Requirement**	**Container Validity**			
		TSC#1	**TSC#2**	**TSC#3**	**TSC#4**
R-18	The outside volume of any 'outer container' shall be less than 5.7 m length x 2.2 m width x 2.3 m height.	**X**	**X**	**X**	**X**

R-19	The maximum mass of each packed TSCs must be <5 tons.	**X**	**X**	**X**	**X**

3.1.1.4 Survival Conditions

ID	**Requirement**	**Container Validity**			
		TSC#1	**TSC#2**	**TSC#3**	**TSC#4**
R-20	The TSCs must be able to perform with no degradation in transport conditions: • Temperatures between -20°C and +55°C. • Pressure between 800 and 1050 mbar. • Solar radiation <= 100 W/m² • Humidity of 5-100%, and capable of protecting its contents against rain. *NOTE: Rain-proof covers used in conjunction with water-resistant containers (an example of which are shown in the below figure) are the preferred solution and are acceptable. Please indicate in your solution whether the proposed solution is waterproof or water-resistant. It is not necessary nor desired for the outer container to be able to survive a 'dunk test' without leaking but to keep the content dry if left for a reasonable period in the rain with covers installed*	**X**	**X**	**X**	**X**

					
R-21	TSC#1,2,3 must be able to withstand impacts and vibrations due to handling and transport as defined below:	**X**	**X**	**X**	**N/A**

	– Sinusoidal Vibrations during air transportation and road transportation : **F (Hz)** / **ACCELERATION/AMPLITUDE** 0.1 à 1 : ± 50 mm 1 to 5 : ± 8 mm 5 to 20 : ± 1.25 mm 20 to 200 : 2 g 200 to 300 : 3 g – Random Vibrations during air transportation : **Frequency range** / **Level** / **Global (g_{xxx})** 5 Hz – 10Hz : +6 db/oct. 10 Hz – 100 Hz : 0.003 g²/Hz 100Hz –200 Hz : -12 db/oct. 200Hz – 400 Hz : 0.0001875 g²/Hz Global : 0.64 – Quasi Static loads during air transportation : **Aircraft Axis** / **X (forward)** / **Y** / **Z (+ up)** Landing : +1.5 g : ±1.5 g : -2.0 g Take-off : -1.5 g : 0 g : +2.0 g / -1.5 g – Shock during the air transportation : 4.2g / 20 ms (½ sinus profile) – Shock during road transportation : 10g for max. 10ms (½ sinus profile) – For road transport, container damping system 1st modal should be between 5 and 10 Hz.				
R-22	TSC#4 must be able to withstand impacts and vibrations due to handling and transport as defined below: • Vibrations of 5.5 to 200 Hz: ±1.5g • Impacts o Road and air transport: up to 8g for 5 to 50 ms o Handling: up to 3g for 15 ms, and 10g for 10 ms	**N/A**	**N/A**	**N/A**	**X**

	○ Accelerations (air): up to 3 g Attenuation requirements for contents of containers TBC.				

3.1.1.5 Monitoring

ID	Requirement	Container Validity			
		TSC#1	TSC#2	TSC#3	TSC#4
R-23	Each TSC must have a means of monitoring the pressure inside the 'inner container', to ensure that there is a positive pressure difference from inside the 'inner container' to the outside. This must be viewable on the 'outside container' with or without lid. *Note 1: if this is unrealistic, the Bidder is asked to advise if it might be better to monitor humidity instead, with the understanding that this will remain low as long as the dry N2 is still present.*	**X**	**N/A**	**X**	**X**
R-24	During the transport phase TSC#1 shall be equipped with a three-axes logger positioned "after" the wire-roped isolated frame (so as to monitor the shock seen by the TSC contents and not the TSC itself) with: • A wake-up value of 3g TBC (at which point the logger starts recording) • A warning value of 10g TBC (at which point a red alarm begins to indicate an issue)	**X**	**N/A**	**N/A**	**N/A**
R-25	During the transport phase outside containers shall be equipped with witness shock indicators consisting of a bar which becomes red if subjected to levels of shock exceeding a threshold. Indicators required for 10g, 25g and 50g.	**X**	**X**	**X**	**X**

	NOTE 1: These indicators/logging devices can be the same device as used for R-26				
R-26	TSC#1 shall be equipped with a meter to display the current and max reached humidity during transport and storage to show the conditions inside the outside container that is viewable on the outside of the TSC. TSCs #3 and #4 shall be equipped with an indicator that triggers at 50% RH.	**X**	**N/A**	**X**	**X**

3.1.1.6 Lifetime Degradation

ID	**Requirement**	**Container Validity**			
		TSC#1	**TSC#2**	**TSC#3**	**TSC#4**
R-27	The TSCs shall have a lifetime of 25 years, without degradation. In the case that there are components with lifetimes shorter than 25 years (or dependent upon a number of uses), full details of all such critical items, with their replacement timeframe and details for re-procurement must be provided and approved with STFC before use.	**X**	**X**	**X**	**X**

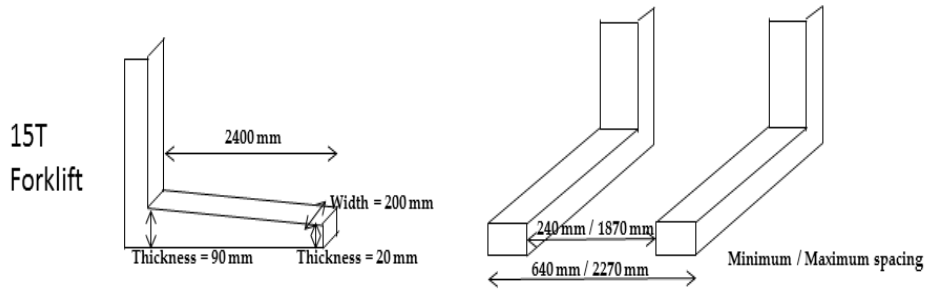
3.1.1.7 Materials Used

ID	**Requirement**	**Container Validity**			
		TSC#1	**TSC#2**	**TSC#3**	**TSC#4**
R-28	All materials used in the 'inner container' of the TSCs must be made from clean non-outgassing materials, with TML < 1% and CVCM < 0.1%.	**X**	**X**	**N/A**	**N/A**
R-29	The 'inner container' and inside bagging shall be anti-ESD.	**X**	**X**	**X**	**X**

R-30	No exposed hygroscopic materials or components may be used in the TSCs, nor any materials liable to corrosion, unless they are not essential to overall TSC performance (e.g. handles) *NOTE 1: Use of timber (etc) is acceptable provided that it is suitably coated* *NOTE 2: Please list any such materials (hygroscopic/corroding) as requiring maintenance, with expected lifetime/replacement timeframes.*	**X**	**X**	**X**	**X**
R-31	All materials used in the 'inner container' shall be non-shedding and compliant with particulate contamination of less than 180 ppm.	**X**	**X**	**X**	**N/A**

3.1.1.8 Manual Handling and Mechanical

ID	**Requirement**	**Container Validity**			
		TSC#1	**TSC#2**	**TSC#3**	**TSC#4**
R-32	Specific areas under the TSC shall allow the container to be put on a wedge in order to relieve the loading on the wheels during the storage phase, and to avoid overloading the wheels with the tie-down straps when the containers are being locked onto e.g. the truck during transport. It is foreseen that this can be solved either by using wheels on jacks or by using dedicated blocks stored on the external side of the container which can be removed to place under the container for storage and transport phases. Bidder to advise.	**X**	**X**	**X**	**X**
R-33	The 'outside container' of large containers (Bidder to advise) shall have lifting interfaces for forklift (for lifting the fully-loaded container) and be compatible with crane equipment (for lifting the lid-alone off the container, if applicable). The forklift interfaces shall be lifting pockets in order to be transportable by forklift truck. Lifting tunnels shall be compliant with the forklift . All the security requirements regarding the minimum size of	**X**	**X**	**X**	**X**

	forklift to use shall be provided. Forklift interfaces shall be centred with regard to the CoG of the load.  Figure 3-2: Fork dimensions				
R-34	The 'inner container' and mounting platform shall have lifting interfaces for forklift equipment. These can be structure built into the inner container	**X**	**X* For phase separator only**	**X**	**N/A**
R-35	The TSCs shall have four jackable castor wheels in (white) polyamide, with brakes, in order to move it easily on the floor. The mount of the wheels shall be made of stainless steel. The Push-pull effort shall be less than 40 daN. They are not to be shock-mounted	**X**	**X**	**X**	**X**
R-36	The TSCs shall be compliant with the following load: $P_{punch} < 0.5$ daN/mm² and $P_{floor\ allowable\ load} < 1500$ daN/m²	**X**	**X**	**X**	**X**

3.1.1.9 Identification and Markings

ID	Requirement	Container Validity			
		TSC#1	TSC#2	TSC#3	TSC#4
R-37	The SWL of the container shall be clearly displayed on the outside of the container by the Bidder and be legible from at least 3m away.	X	X	X	X
R-38	Each container shall be identified with a marking applied on 3 sides (not including underside), which contains the following data in English: a. Project name: 'MTG' painted in black (letters height: 100mm) b. Identification of the contents painted in black: OGSE code and serial number (letters height: 50mm): to be provided by STFC. c. PTI number and identification (letters height: 15mm): to be provided by STFC. d. Contractor name painted in black (letters height: 30mm): 'STFC' e. Weight painted in black (letters height: 15mm): Empty Weight in kg, and Total Weight in kg: weight of contents to be provided by STFC. f. Overall dimension in centimeter (letters height: 15mm): Length x Width x Height g. Support points for lifting devices painted in black h. Important functional information painted in red i. CoG marking on 4 sides.	X	X	X	X

3.1.2 Acceptance Review and Documentation

3.1.2.10 Acceptance testing

ID	Requirement	Container Validity			
		TSC#1	TSC#2	TSC#3	TSC#4
R-39	Acceptance testing shall be performed by the Bidder. The scope of the acceptance testing, and test method(s), shall be recommended by the Bidder in accordance to industry standard.	X	X	X	X

3.1.2.11 Documentation

ID	Requirement	Container Validity			
		TSC#1	TSC#2	TSC#3	TSC#4
R-40	Manufacturer's data shall be supplied for all components, including operating manuals, a full parts list, maintenance requirements and test/conformance certificates. It shall also include a statement of expected product life and period of support, and provide contact details with which both STFC and the final customers in Europe can procure spare parts should they be necessary over the 25-year period of use of the blackbodies. All test reports and analysis results shall be provided to STFC	X	X	X	X

3.1.2.12 CE Marking

ID	Requirement	Container Validity			
		TSC#1	TSC#2	TSC#3	TSC#4
R-41	The final system and components shall be CE marked, where applicable, and a copy of the Technical File that justifies the CE mark shall be provided by the Bidder. The Bidder shall advise in their proposal which directives apply to this type of equipment, to which they shall be	X	X	X	X

	compliant in order to obtain the CE marking. In the case that CE marking is not applicable to containers, the Bidders will provide upon delivery a technical file which justifies the safety and suitability of design choices made against suitable directives/design standards.				

3.1.2.13 Review Requirements

ID	Requirement	Container Validity			
		TSC#1	TSC#2	TSC#3	TSC#4
R-42	Two reviews shall be conducted: • A Design Review shall be conducted once the TSC design is complete, but before the manufacturing and procurement phase. This review shall take place within 4 weeks of kick-off. • Delivery shall be within 12 weeks of kick-off. • An Acceptance Review shall be performed following Acceptance Testing. This Review shall also assess the documentation of Section 0. This shall take place within 14 weeks of kick-off.	**X**	**X**	**X**	**X**

4 Appendix

This appendix contains a list of all components of the OGSE to be stored/transported in the TSCs. These are organised into 4 transport boxes. **In the case that the stored item is an assembly, the outside of the assembly will be shown.**

The table is listed in order of transport container. Images of the main assemblies have been supplied for convenience. Dimensions can be found in the corresponding drawings.

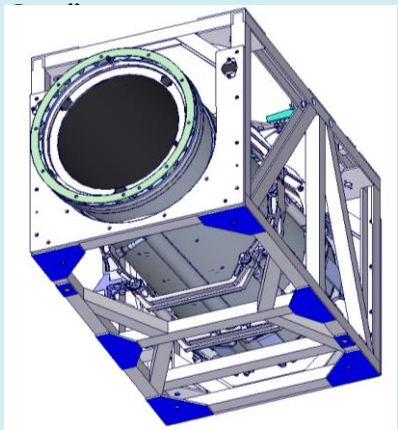
4.1 List of items for transportation

These drawings and models are given in
https://drive.google.com/open?id=17_J65p_IkWJSphN6cfZn-FlbRKuzNCKZ

For column "Reference":
D = Drawing
M = Model
P = Photograph
W = Weblink

If an item is itemised as delicate and foam mounted, the foam insert should be a good fit for the specific part; if the item is itemised as foam mounted, but not as delicate, there doesn't need to be a bespoke/good fit for the specific part within the foam mounting.

The items are colour coded depending on container.

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
KE-0269-511	VBB DSBB BB Assy Upper Config 	285kg		1	1	M		Y	M
KE-0269-500	VBB DSBB BB Assy Lower Config	287kg		1	1	M		Y	M
KE-0269-503	VBB and DSBB Base Frame Assy	54kg		1	1	M		Y	M

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
KE-0269-1430	VBB & DSBB Ball Transfer Unit	13kg		4	2	M		N	M
P1-22103+P3-22107	TAS-F LN2 Flange	15kg		2	2	D		N	F
KE-0269-1100	TAS-F He and Electrical Flange	49kg		1	2	D/M		Y	F
TBD	TAS-F EGSE Vacuum harnessing	TBD – expected ~10kg	Ø15mm at 20m length Coiled dimensions: 400mm diameter, 200mm height	6	2	-		N	F
TBD	TAS-F EGSE Spare Vacuum harnessing	TBD – expected ~10kg	Ø15mm at 20m length Coiled dimensions: 400mm diameter, 200mm height	3	2			N	F

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
TBD	TAS-F EGSE Airside harnessing	TBD – expected ~10kg	Ø15mm at 20m length Coiled dimensions: 400mm diameter, 200mm height	6	2	-		N	F
TBD	TAS-F EGSE Spare Airside harnessing	TBD – expected ~10kg	Ø15mm at 20m length Coiled dimensions: 400mm diameter, 200mm height	3	2	-		N	F
TBD	TAS-F EGSE flange testing cables	TBD – expected ~8kg	Ø8mm at 20m length Coiled dimensions: 300mm diameter, 200mm height	2	2	-		N	F

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
KE-0269-1346	TAS-F LN2 1/2 inch flex inlet – 2.5m	TBD – expected <1.0kg per metre	Coiled dimensions: 480mm diameter, 50mm height	2	2	W	Swagelok_Stainless Steel Flexible Tubing	N	F
KE-0269-1346	TAS-F LN2 1/2 inch flex inlet – 6.2m	TBD – expected <1.0kg per metre	Coiled dimensions: 480mm diameter, 50mm height	1	2	W	Swagelok_Stainless Steel Flexible Tubing	N	F
KE-0269-1343	TAS-F LN2 DN40CF flex exhaust – 1m	TBD – expected <1.5kg per metre	Max diameter: 70mm. Do not coil	1	2	W	Lesker_FormedBellows	N	F
KE-0269-1343	TAS-F LN2 DN40CF flex exhaust – 1.8m	TBD – expected <1.5kg per metre	Length 1.8m. Max diameter is 70mm. Do not coil	1	2	W	Lesker_FormedBellows	N	F
TBD	TAS-F LN2 DN50CF facility exhaust – 20m total. 1 to 1.5 metre sections	TBD – expected <1.5kg per metre	Expect in sections of 1 to 1.5m. Do not bend	1	2	W	Lesker_FormedBellows	N	F

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
KE-0269-1342	TAS-F LN2 DN50CF exhaust – 7m	TBD – expected <1.5kg per metre	Max diameter: 90mm. Bend radius and coil dimensions TBD	1	2	W	Lesker_FormedBellows	N	F
KE-0269-1341	TAS-F He DN50CF 70mm flex - 14m (two lengths of 7m)	TBD – expected <2.0kg per metre	Split into two separate 7m pipes. Max diameter: 90mm Bend radius and coil dimensions TBD	1	2	W	Lesker_FormedBellows	N	F
TBD	TAS-F He DN50CF 70mm flex in vac - 2m	TBD – expected <2.0kg per metre	Max diameter 90mm. Two separate pipes of 2.1m and 1.9m. Do not bend	2	2	W	Lesker_FormedBellows	N	F
TBD	Heaters	TBD – expected <0.1kg each		6	2	M/P	DSCN4451	N	F

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
TBD	Thermistors	TBD – expected <0.1kg each	Wooden box ~20cm x 20cm x 5 cm	1	2	P	DSCN1842	Y	F
TBD	1m DN40 flex	TBD – expected <1.5kg each	Max diameter 70mm. Manufacturer does not recommend bending	5	2	W	Lesker_FormedBellows	N	F
KE-0269-1346	1m ½" flex	TBD – expected <1.0kg each	Coiled dimensions: 480mm diameter, 25mm height	5	2	W	Swagelok_Stainless Steel Flexible Tubing	N	F
TBD	1m DN50 flex	TBD – expected <2.0kg each	Max diameter: 90mm Manufacturer does not recommend bending	5	2	W	Lesker_FormedBellows	N	F
COTS	DN40 CF copper gasket	~0.3kg		20	2	W	Pfeiffer_490DFL040-S10.en.pdf	N	F

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
COTS	1/2″ VCR gasket	~0.05kg		50	2	W	Swagelok VCR-Metal-Gasket-Face-Seal	N	F
COTS	DN50 CF copper gasket	~0.1kg		5	2	W	Lesker OFHC Gasket	N	F

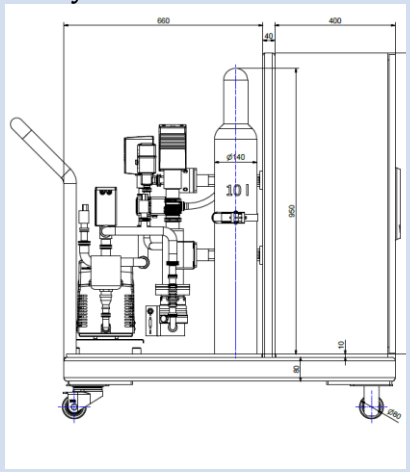
Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
	KVM Switch system · USB VGA Console Extender over CAT5 UTP (SV565UTPUGB) · 4 port rack mountable USB KVM switch with Audio and USB hub (SV431USBAEGB) · 1U rackmount brackets for KVM switch (SV431RACK) · 6 ft 2-in-1 USB KVM Cable (SVUSB2N1_6)	~0.3kg		1	2	W	• https://docs-emea.rs-online.com/webdocs/1447/0900766b8144771f.pdf • https://docs-emea.rs-online.com/webdocs/1447/0900766b81447722.pdf • http://cdn-docs.av-iq.com/dataSheet//SV431RACK_Datasheet.pdf • https://www.startech.com/uk/Server-Management/Cables/6-ft-USB-VGA-2-in-1-KVM-	N	F

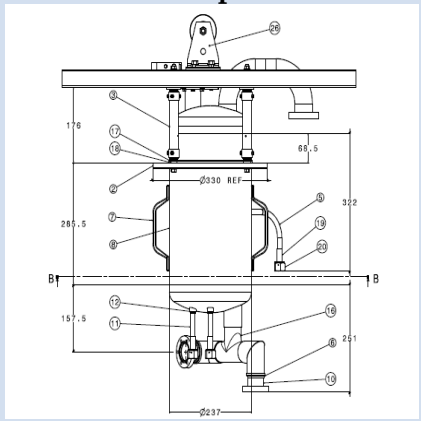
Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
COTS	Dell 18.5in LED KMM DKMMLED185-204(French keyboard)	~5kg		1	2	W	http://www.dell.com/en-uk/shop/dell-185in-led-kmm-dkmmled185-204-french-keyboard/apd/a7485908/networking	N	F
COTS	RS232 Bridge MOXA UPort 1650-16	~0.5kg		1	2	W	https://www.moxa.com/doc/specs/UPort_1600-16_Series.pdf	N	F
Eurotherm 2704	Temperature controllers for 3 PID loops	TBD – expected <5kg	96 x 96 x 150 mm	1	2	W	https://www.eurotherm.com/products/temperature-controllers/multi-loop/2704	Y	F
TBD	TAS-F in-vac harnesses	TBD – expected <20kg	Ø½"	1	2	-		N	F
TBD	TAS-F in-air harnesses	TBD – expected <20kg	Ø½"	1	2	-		N	F

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
TBD	Electronic pressure transducer with remote interface	TBD – expected <0.5kg	50 x 50 x 100 mm	1	2	-		N	F
TBD	Pressure regulator	TBD – expected <0.5kg		1	2	W	https://www.the-gas-safety.co/HELIUM-2-STAGE-0-2-barG-Base-Entry-BS-No3-Outlet-G-38.aspx	N	F
P 0101 090	Overpressure safety valve P 0101 090	TBD – expected <0.5kg	50 x 50 x 50 mm	1	2	-		N	F
Pfeiffer PT R26 855	ActiveLine Pirani/capacitance transmitter	0.12kg		1	2	W	Pfeiffer_PTR26855	N	F
Pfeiffer PF A44 536	Forevacuum safety valve	2kg		1	2	W	Pfeiffer_A44_536	N	F
Siemens PSU 100 S	SITOP Smart - Single Phase 24V/20A	2.4kg		1	2	W	Siemens_Product_6EP1336-3BA10	N	F
Pfeiffer PM 061 340 - T	TPS 110, Power supply for wall/standard rail fitting	0.7kg		1	2	W	TPS_110_PM061340-T.en.pdf	N	F

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
Part 5 in P1-22103	DN6 2.1BAR PRV	~0.5kg	Ø40 – 70LG	1	2	D, P	Item 5 on P1-22103 – Flange Assembly Sheet 1	N	F
Part 3 in P3-22107	0.5 BAR PRV	~0.5kg	Ø60 – 140LG	1	2	P	0.5 bar PRV.jpg	N	F
Part 15 in P3-22107	1 1/2" NON-RETURN VALVE - FIG 113S BS 5154 PN25	~1kg	Ø80 – 210LG	1	2	P	Non return valve.jpg	N	F
P1-22001	Level probe	~1kg		1	2	D		N	F
Part 6 in P3-22107	Burst disc (A.S. Scientific Proprietary ~10 psi)	~0.2kg	Ø115 – 160LG	1	2	P	Burst disc 1.jpg	N	F
SS-8-VCR-3 + SS-8-VCR-1	VCR fitting	TBD – expected <0.5kg		1	2	W	https://www.swagelok.com/en/catalog/Product/Detail?part=SS-8-VCR-3	N	F
J536 208 006	Jaeger connector	TBD – expected <0.5kg	50 x 50 x 100 mm	1	2	-			
J042 955 006	Jaeger connector	TBD – expected <0.5kg	50 x 50 x 100 mm	1	2	-			

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
LESKER DN50 HN-0337R	TAS-F He in-out connectors	TBD – expected <0.5kg		1	2	D	hn-0337r.pdf	N	F
233-103-H8Z123-21SN-03	Heater BB electrical connectors	~0.5kg		1	2	M		Y	F
233-103-H8Z119-35SN-03	Sensor BB electrical connectors	~0.5kg		1	2	M		Y	F
233-103-H7Z123-21SN-03	Heater TVAC electrical connectors	~0.5kg		1	2	M		Y	F
233-103-H7Z119-35SN-03	Sensor TVAC electrical connectors	~0.5kg		1	2	M		Y	F
KE-0269-536	LN2 ASSY FRAME	61kg		1	2	M		N	M
KE-0269-537	Cavity Assy Frame	60kg		1	2	M		N	M
KE-0269-150	BB/He System/Transformer Spreader Frame	TBD – expected ~20kg		1	2	D		N	F

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
PPS10100	He System 	320kg		2	3	D/M		N	M

Part#	Title	Mass	Envelope	Qty	TSC #	Reference	Photograph/Weblink	Delicate	In ESD-foam or mounted (F vs M)
KE-0269-1305	TAS-F Phase Separator 	40kg		1	3	M		N	M
KE-0269-720	TAS-F EGSE	200kg		1	4	P	EGSE	N	M
CMT20K/151	Transformer	220kg		1	03/04	D		N	M