Invitation To Quote Specification

Invitation To Quote (ITQ) on behalf of UK Research & Innovation

Subject: UKSBS PR19081 Transport & Storage Containers

Sourcing reference number: UKSBS PR19081

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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).

For OHB, this will consist of:

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

The OGSEs will be transported from STFC to OHB where they will be intermittently in use and in storage over a 20 year timespan.

The Bidder is asked to provide for the OHB calibration rig and associated equipment:

- **A Firm Fixed Price**
- **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 for both sets of containers.**

1.2 *Scope*

- This requirement is for the design, manufacture and delivery of 5 units (TSC#1, TSC#2 [consists of two boxes 2a and 2b], TSC#3, TSC4) of dual-purpose Transport and Storage Containers (TSC) in which all OHB components of the OGSE are housed.

- This document describes the requirements for the dual-purpose Transport and Storage Containers (TSC) in which all OHB components of the OGSE are housed.

- The delivery of the TSCs will be to :
  RAL Space
  STFC - Rutherford Appleton Laboratory
  Oxfordshire
  OX11 0QX

- It is required that the goods are delivered to RAL Space within 18 weeks from contract award to delivery.

- The inner and outer bags will be provided by STFC approved supplier. The bidder will be required to liaise this supplier.

1.3 *Applicable Documents*

AD #	Document #	Title
AD1	**KE-0259-001**	OHB VBB and CBB#1 Frame Assy
AD2	**MTG-KT-IR-DI-S12KC6100-001-01**	VBB and CBB#1 Interface
AD3	**MTG-KT-IR-DI-S12KC6200-001-01**	CBB#2 Interface
AD4	**KE-0269-900**	BBM Cavity Assy Frame Model and Drawing
AD5	**PPS10100**	Helium System Model
AD6	**PP S10 100**	Helium System Drawing
AD7	**PP S10 103**	Helium System (Simplified) Drawing
AD8	**MANUAL CMT20K-151-1_pages8-13**	Transformer Drawings

2 Summary Entabulation of Most Important Requirements per Transport and Storage Container

Some simplifications for specific containers are preferred, as not all requirements need be applied to all TSCs; an overview of these requirements 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.

MOST IMPORTANT REQUIREMENTS FOR CONTAINERS ARE LISTED HERE							
TSC		**R-3**	**R-6**	**R-8**	**R-17**	**R-18**	**R-20**
		Wire-rope isolators	**Lifting container body**	**Ramp for rolling out contents**	**Pressure monitor**	**OHB MSR165 recorder vs shock indicator**	**Temperature and humidity monitor**
VBB, CBB#1 and frames	**TSC#1**	x	n/a	n/a	x	x (recorder for VBB and CBB#1, indicator on container)	x (logger)
Tools, assembly frames, Helium flange, harnesses, pipework	**TSC#2a**	n/a	n/a	n/a	n/a	x (indicator)	x (indicator)

Spares	**TSC#2b**	n/a	n/a	n/a	n/a	x (indicator)	x (indicator)
Helium systems, CBB#2, transformer	**TSC#3**	x	x	x	x	x (recorder for CBB#2, indicator on container)	x (logger)
EGSE	**TSC#4**	n/a	x	x	n/a	indicator	x (indicator)

3 Transport and Storage Container (TSC) 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 hard container (constructed of whatever material the bidder deems appropriate given all other requirements)
    - *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.*
- an inner container: consisting of outer bags, inner bags and mounts/rails. Note that the bags will be provided by an STFC approved supplier, the bidder shall be prepared to liaise with this supplier.

NB:

- **Not all containers require mounting systems with wire rope isolation, these are marked in the requirements**
- **No silicone or silicone-based adhesives are to be used in the manufacture of these transport and storage containers**

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 be shipped once from the UK to Europe, where they will spend most of their 20 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. Please refer to Section 5 for a list of components associated with each TSC.

All of the components described in this specification, except the inner and outer bags of the inner container, are deliverable as part of this contract and are to be provided to STFC by the Bidder. Bidders are asked to make it clear if they do not intend to provide all such components, or if there are limitations to their proposed solutions.

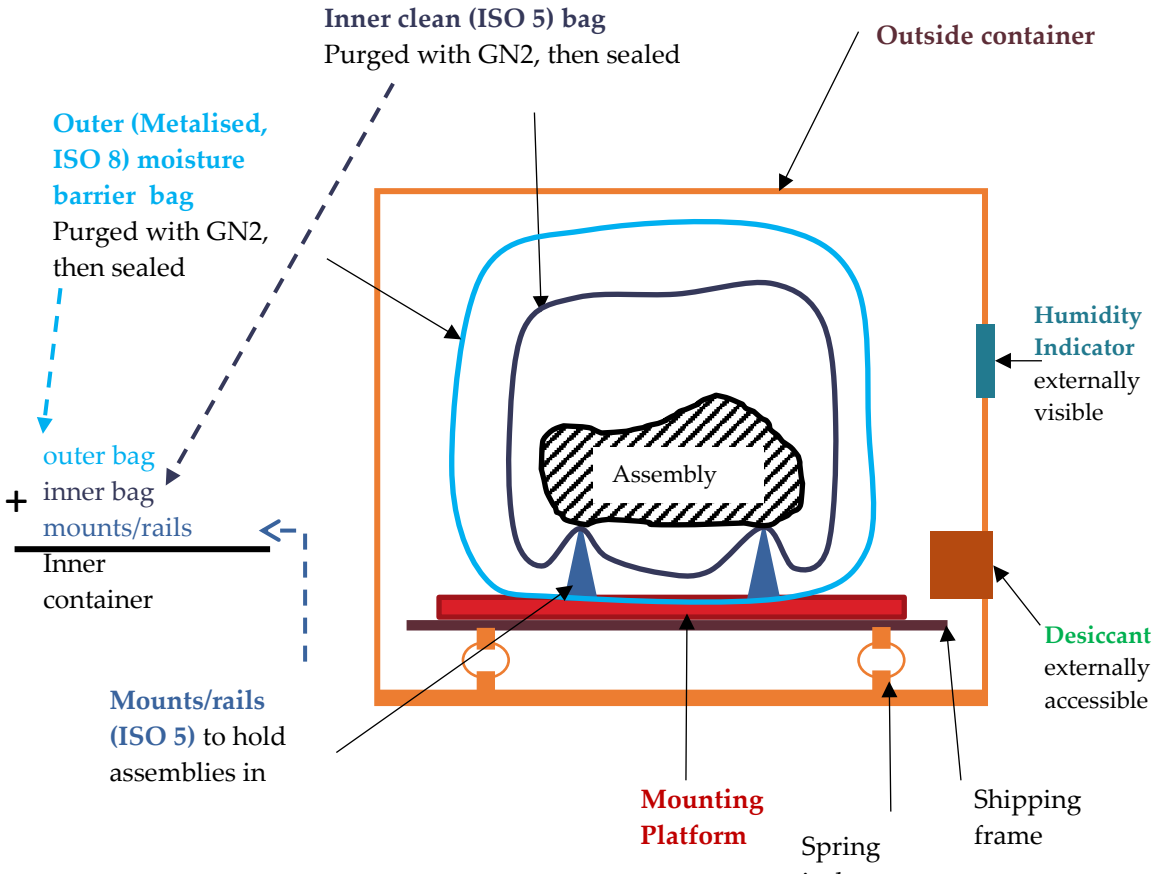

Figure 3-1 Transport/Storage Container (TSC)

Note that the bidder does not need to provide the inner and outer bags, but will need to provide mounts/rails where required. These are included in Figure 3-1 for reference. Bidders must be able to work with the STFC approved supplier who will be providing the inner and outer bags of the inner container.

Note that there is a minimum warranty of 12 months on the TSCs.

4 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.

4.1 Transport and Storage concept description and contents

ID	Requirement	Container Validity X/(N/A)			
		TSC#1	TSC#2a and 2b	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). The inner container, with the exception of any mounts/rails, shall be provided by an STFC approved supplier. *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 be limited to the inner container wire rope insulators; i.e. no shock mounting on castors.*	X	X	X	X
R-3	The containers shall have a mounting system with wire-rope isolation	X	N/A	X	N/A

R-4	TSC#1 shall provisionally contain the following: • Two of the blackbody assemblies (to be put in separate inner (ISO5) and separate outer (ISO8) bags. Please note that each inner bag should rest 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 blackbodies	**X**	**N/A**	**N/A**	**N/A**
R-5	TSC# 2a and 2b shall provisionally contain the following: • accessories and tools for the blackbodies; • the assembly frames, • any ancillary tooling required for assembly/disassembly such as lifting plates; • one Helium supply flange, • one electrical flange • the associated harnesses (in-air and in-vacuum), • the Helium pipework • and spare components; • spreader frame and lifting equipment for blackbodies, Helium supply systems and transformer	**N/A**	**X**	**N/A**	**N/A**
R-6	TSC#3 shall provisionally contain the following: • Two Helium supply Systems • One of the blackbody assemblies (to be put in separate inner (ISO5) and separate outer (ISO8) bags. Please note the inner bag should rest on a set of mounts/rails (ISO 5 compatible) which acts to both hold the bagged assembly in place and to provide lifting interfaces • A transformer and its associated harnessing *NOTE: It is preferable for this TSC, but not required, that the outer container has a "top-hat" which can be lifted off of the container base for handling purposes. That said, if this is impractical or much more expensive, it is not required, but rather a nice-to-have.*	**N/A**	**N/A**	**X**	**N/A**

	 Figure 4-1: "Top-hat" container body which lifts off of container base.				
R-7	TSC#4 shall provisionally contain the following: • Components of the EGSE, including the EGSE cabinet in its fully assembled state *NOTE : 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-8	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 which is simpler but functionally the same. If a ramp is provided, it would be appreciated if it could be used with OHB TSC#3 as well to roll the heavy items (max. 320kg) off the base. *NOTE : For TSC#4 if a top-hat lid is provided (R-6) and has the correct lifting fixtures, a ramp is not required.*	**N/A**	**N/A**	**X**	**X**

4.1.1 Overall Design and Function

4.1.1.1 *TSC Components: Inside and Outside Containers*

ID	Requirement	Container Validity			
		TSC#1	TSC#2a and 2b	TSC# 3	TSC#4
R-9	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-10	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 or sea 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

4.1.1.2 *Volume and Mass*

ID	Requirement	Container Validity			
		TSC#1	TSC#2a and 2b	TSC#3	TSC#4
R-11	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-12	The maximum mass of each packed TSC must be <5 tons.	X	X	X	X

4.1.1.3 *Survival Conditions*

ID	Requirement	Container Validity			
		TSC# 1	TSC#2a and 2b	TSC# 3	TSC# 4

<table>
<tr><td>R-13</td><td>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. 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.</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>R-14</td><td>TSC#1,2,3 must be able to withstand impacts and vibrations due to handling and transport as defined below:
Road and/or boat transport at the load bed of the transport vehicle:

Sinusoidal Vibrations during road transportation:

<table><tr><th>F (Hz)</th><th>ACCELERATION/AMPLITUDE</th></tr><tr><td>0.1 to 1</td><td>± 50 mm</td></tr><tr><td>1 to 5</td><td>± 8 mm</td></tr><tr><td>5 to 20</td><td>± 1.25 mm</td></tr><tr><td>20 to 200</td><td>2 g</td></tr><tr><td>200 to 300</td><td>3 g</td></tr></table>
For road transport, container damping system first modal should be between 5 and 10 Hz</td><td>X</td><td>X</td><td>X</td><td>N/A</td></tr>
<tr><td>R-15</td><td>TSC#4 must be able to withstand shocks and vibration during handling and transport as defined below:
Vibrations of 5.5 to 200 Hz: ±1.5g</td><td>N/A</td><td>N/A</td><td>N/A</td><td>X</td></tr>
</table>

	• Shocks o Road transport: up to 8g for 5 to 50 ms • Accelerations o Up to 3g constantAccelerations (air): up to 3 g constant vertical (banking) For road transport, container damping system first modal should be between 5 and 10 Hz				

4.1.1.4 *Monitoring*

ID	Requirement	Container Validity			
		TSC#1	TSC#2a and 2b	TSC#3	TSC#4
R-16	During the transport phase TSC#1 and TSC#3 shall be equipped with a mounting plate for an MSR165 recorder, positioned "after" the wire-roped isolated frame (so as to monitor the shock seen by the TSC contents and not the TSC itself)	X	N/A	X	N/A
R-17	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. *NOTE: These indicators/logging devices can be the same device as used for R-16*	X	X	X	X
R-18	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. This meter shall be 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

4.1.1.5 *Lifetime Degradation*

ID	Requirement	Container Validity			
		TSC#1	TSC#2a and 2b	TSC#3	TSC#4
R-19	The TSCs shall have a lifetime of 20 years, without degradation. In the case that there are components with lifetimes shorter than 20 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

4.1.1.6 *Materials Used*

ID	Requirement	Container Validity			
		TSC#1	TSC#2a and 2b	TSC#3	TSC#4
R-20	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: Please list any such materials (hygroscopic/corroding) as requiring maintenance, with expected lifetime/replacement timeframes.*	X	X	X	X
R-21	No timber may be used in the construction of the outer container	X	X	X	X

4.1.1.7 *Manual Handling and Mechanical*

ID	Requirement	Container Validity			
		TSC #1	TSC#2a and 2b	TSC# 3	TSC#4
R-22	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	X	X	X	X

	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.				
R-23	The 'outside container' of large containers (Bidder to advise) shall have lifting interfaces for a standard 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 a standard forklift truck (these dimensions will be confirmed by STFC). Lifting tunnels shall be compliant with the forklift. Forklift interfaces shall be centred with regard to the CoG of the load.	**X**	**X**	**X**	**X**
R-24	The mounting platform shall have lifting interfaces for forklift equipment.	**X**	**N/A**	**X**	**N/A**
R-25	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-26	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**

4.1.1.8 Identification and Markings

ID	Requirement	Container Validity			
		TSC# 1	TSC#2a and 2b	TSC#3	TSC# 4
R-27	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-28	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**

4.1.2 Acceptance Review and Documentation

4.1.2.9 *Acceptance testing*

ID	Requirement	Container Validity			
		TSC#1	TSC#2a and 2b	TSC#3	TSC#4
R-29	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

4.1.2.10 *Documentation*

ID	Requirement	Container Validity			
		TSC#1	TSC#2a and 2b	TSC#3	TSC#4
R-30	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 20-year period of use of the blackbodies. All test reports and analysis results shall be provided to STFC	X	X	X	X

4.1.2.11 *CE Marking*

ID	Requirement	Container Validity			
		TSC#1	TSC#2a and 2b	TSC#3	TSC#4
R-31	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 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.	X	X	X	X

4.1.2.12 *Review Requirements*

ID	Requirement	Container Validity			
		TSC#1	TSC#2a and 2b	TSC#3	TSC#4
R-32	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 • An Acceptance Review shall be performed following Acceptance Testing. This Review shall also assess the required documentation. This shall take place 2 weeks after delivery.	X	X	X	X

5 Appendix

This appendix contains a list of all components of the OGSE to be stored/transported in the TSCs. These are organised into 5 transport boxes. **In the case that the stored item is an assembly, the outside of the assembly will be shown.**

Mass, length and quantity estimates are included – these are likely to be updated but are included to give an idea of the values of these parameters for each part/assembly.

5.1 List of items for transportation

Relevant drawings and models are given in the following webpage:
https://drive.google.com/drive/folders/195NaD9ks_jxyrCjIS6jotgdbWGfSJefi

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 does not 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 #	Ref	Photo/ Weblink	Delicate	In ESD-foam or mounted (F vs M)
TBD	VBB CBB#1 BB Assy	~315 kg	~1475 by ~780 by ~734 mm	2	1	M		Y	M
TBD	VBB and CBB#1 Base Frame Assy	~42 kg	~1414 by ~700 by ~215 mm	1	1	M		Y	M
TBD	OHB Helium Flange	TBD	Outer Ø 490mm	1	2a	-		Y	F
TBD	OHB Electrical Flange	TBD	Outer Ø 490mm	1	2a	-		Y	F

Part #	Title	Mass	Envelope	Qty	TSC #	Ref	Photo/ Weblink	Delicate	In ESD-foam or mounted (F vs M)
TB D	OHB EGSE Vacuum harnessing	TBD – expected ~10kg	Ø15mm at 20m length Coiled dimensions: 400mm diameter, 200mm height	6	2a	P	See Google Drive	N	F
TBD	OHB EGSE Spare Vacuum harnessing	TBD – expected ~10kg	Ø15mm at 20m length Coiled dimensions: 400mm diameter, 200mm height	3	2b	P	See Google Drive	N	F
TBD	OHB EGSE Airside harnessing	TBD – expected ~10kg	Ø15mm at 20m length Coiled dimensions: 400mm diameter, 200mm height	6	2a	P	See Google Drive	N	F
TBD	OHB EGSE Spare Airside harnessing	TBD – expected ~10kg	Ø15mm at 20m length Coiled dimensions: 400mm diameter, 200mm height	3	2b	P	See Google Drive	N	F
TBD	OHB EGSE flange testing cables	TBD – expected ~8kg	Ø8mm at 20m length Coiled dimensions: 300mm diameter, 200mm height	2	2a	-		N	F
TBD	OHB 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	2a	W	Lesker_ Formed Bellows	N	F

Part #	Title	Mass	Envelope	Qty	TSC #	Ref	Photo/ Weblink	Delicate	In ESD-foam or mounted (F vs M)
TBD	OHB 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	2a	W	Lesker_ Formed Bellows	N	F
TBD	Heaters	TBD – expected <0.1kg each		6	2b	M/P	See Google Drive	N	F
TBD	1m DN40 flex	TBD – expected <1.5kg each	Max diameter 70mm. Manufacturer does not recommend bending	5	2a	W	Lesker_ Formed Bellows	N	F
TBD	1m ½" flex	TBD – expected <1.0kg each	Coiled dimensions: 480mm diameter, 25mm height	5	2a	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	2a	W	Lesker_ Formed Bellows	N	F
COTS	DN40 CF copper gasket	~0.3kg		20	2b	W	Pfeiffer_490DFL040-S10.en.pdf	N	F
COTS	1/2" VCR gasket	~0.05kg		50	2b	W	Swagelok VCR-Metal-Gasket-Face-Seal	N	F
COTS	DN50 CF copper gasket	~0.1kg		5	2b	W	Lesker OFHC Gasket	N	F

	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	2b	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
COTS	Dell 18.5in LED KMM	~5kg		1	2b	W	https://www.de	N	F

Part #	Title	Mass	Envelope	Qty	TSC #	Ref	Photo/ Weblink	Delicate	In ESD-foam or mounted (F vs M)
	DKMMLED185-205 (German keyboard)						ll.com/en-uk/shop/accessories/apd/a7485909		
COTS	RS232 Bridge MOXA UPort 1650-16	~0.5kg		1	2b	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	2b	W	https://www.eurotherm.com/products/temperature-controllers/multi-loop/2704	Y	F
TBD	OHB in-vac harnesses	TBD – expected <20kg	Ø½"	1	2a	-		N	F
TBD	OHB in-air harnesses	TBD – expected <20kg	Ø½"	1	2a	-		N	F
TBD	Electronic pressure transducer with remote interface	TBD – expected <0.5kg	50 x 50 x 100 mm	1	2b	-		N	F

Part #	Title	Mass	Envelope	Qty	TSC #	Ref	Photo/ Weblink	Delicate	In ESD-foam or mounted (F vs M)
TBD	Pressure regulator	TBD – expected <0.5kg		1	2b	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	2b	-		N	F
Pfeiffer PTR26 855	ActiveLine Pirani/capacitance transmitter	0.12kg		1	2b	W	Pfeiffer_PTR26855	N	F
Pfeiffer PFA44 536	Forevacuum safety valve	2kg		1	2b	W	Pfeiffer_A44_536	N	F
Siemens PSU 100 S	SITOP Smart - Single Phase 24V/20A	2.4kg		1	2b	W	Siemens_Product_6EP1336-3BA10	N	F
Pfeiffer PM 061 340 - T	TPS 110, Power supply for wall/standard rail fitting	0.7kg		1	2b	W	TPS_110_PM061340-T.en.pdf	N	F

Part #	Title	Mass	Envelope	Qty	TSC #	Ref	Photo/ Weblink	Delicate	In ESD-foam or mounted (F vs M)
SS-8-VCR-3 + SS-8-VCR-1	VCR fitting	TBD – expected <0.5kg		1	2b	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	2b	-			
J042 955 006	Jaeger connector	TBD – expected <0.5kg	50 x 50 x 100 mm	1	2b	-			
LES KER DN50 HN-0337 R	OHB He in-out connectors	TBD – expected <0.5kg		1	2b	-		N	F
233-103-H8Z 123-21SN-03	Heater BB electrical connectors	~0.5kg		1	2b	M		Y	F
233-103-H8Z 119-35SN-03	Sensor BB electrical connectors	~0.5kg		1	2b	M		Y	F
233-103-H7Z 123-21SN-03	Heater TVAC electrical connectors	~0.5kg		1	2b	M		Y	F

Part #	Title	Mass	Envelope	Qty	TSC #	Ref	Photo/ Weblink	Delicate	In ESD-foam or mounted (F vs M)
233-103-H7Z119-35SN-03	Sensor TVAC electrical connectors	~0.5kg		1	2b	M		Y	F
TBD	Cavity Assy Frame	60kg		1	2b	M		N	M
TBD	BB/He System/Transformer Spreader Frame	~40 kg	~998 by ~982 by ~232 mm	1	2a	D		N	F
PPS10100	He System	320kg		2	3	D/M		N	M
TBD	CBB#2 BB Assy	80~ kg	~627 by ~685 by ~530 mm~	1	3	M		Y	M
CMT 20K/151	Transformer	265 kg	~800 by ~430 by ~1000 mm	1	3	D		N	M
TBD	OHB EGSE	~ 250 kg	~ H1779.4 - 1809.4 x W800 x D1000mm	1	4	P	See Google Drive	N	M