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Korea Lunar Exploration Program DTN

Declared Materials List for SBC

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REVISION / CHANGE RECORD

Revision	DOCUMENT DATE	REVISION / CHANGE DESCRIPTION	PAGES AFFECTED
Draft 00	21 Oct. 2016	Initial	All
Preliminary 00	07 Nov. 2016	ECSS-Q-70B Group list matching	6
Preliminary 01	22 Mar. 2017	Material specifications were updated.	6
Preliminary 02	17 Apr. 2017	Solder & Epoxy were selected.	6
Preliminary 03	14 Jun. 2017	Aluminum and aluminum alloys / Connecting parts were selected.	6
Preliminary 04	28 Jun. 2017	Coating & Gap pad were changed.	6
Preliminary 05	24 Mar. 2018	Declared Materials List Form were changed.	6-8
Preliminary 06	05 Apr. 2018	Aluminum and aluminum alloys, Coating materials were changed.	6-8
Final 1.0	15 Oct. 2018	Name-plate & Plating were changed.	6-8

Table of Contents

1. INTRODUCTION

This Declared Materials List (DML) includes a common and complete list of all materials of Single Board Computer (SBC). It has been prepared according to Subcontractor Product Assurance Requirements (AD-1) & ECSS-Q-ST-70 (RD-4). The purpose of the DML is to provide a control of the materials, which are foreseen to be used in the satellites.

Furthermore it provides an overview for the usability and acceptability of materials with the project specific technical as well as Subcontractor Product Assurance Requirement and environmental conditions. Each material is listed with the information about its application as well as processing and surface treatment. Items that will be used as procured without modification (e.g. screws) are included in the DPL.

The list formats have been prepared according to in-house formats reflecting all necessary information and specification of the materials. Each Subsystem Material List has been prepared on the lowest functional level (material families). The list status reflects the actual design status.

The DML is under configuration control, initiated for the relevant configuration items at the beginning of the baseline design and updated according to the project milestones. Item number will not be changed; if a part will be deleted it must be indicted by ‘deleted’ without giving the number to another item.

2. APPLICABLE & REFERENCE DOCUMENTS

Unless an explicit document version reference is given, the latest official version at the time of contract shall be assumed.

2.1 APPLICABLE DOCUMENTS

This document will be read in conjunction with document listed hereafter, which form part of this document to the extent specified herein. In case of a conflict between any provisions of this document and the provisions of the documents listed hereafter, the content of the contractually higher document will be considered as superseding.

	Document No.	Title
AD-1	KPLO-D0-210-003	SPAR(KARI)
AD-2	KPLO-D0-524-008	SPAR (ETRI)

2.2 REFERENCE DOCUMENTS

The following documents contain additional information that is relevant to this document. Subcontractor original document number is given in brackets if not in KARI format.

	Document No.	Title
RD-1	ECSS-M-ST-40	Configuration and information management
RD-2	ECSS-Q-ST-10-09	Non-conformance control system
RD-3	ECSS-Q-ST-20	Quality assurance
RD-4	ECSS-Q-ST-70	Materials, mechanical parts and processes
RD-5	ECSS-Q-ST-70-01	Cleanliness and contamination control
RD-6	ECSS-Q-ST-70-02	Thermal vacuum outgassing test for the screening of space materials
RD-7	ECSS-Q-ST-70-71	Data for selection of space materials

3. MATERIALS

The selected material shall be compatible with environments to which they are exposed during any terrestrial test and the mission life.

3.1. SELECTION AND APPROVAL

Materials shall be selected with full consideration of the effects of the space environment and shall satisfy applicable requirements based on the SPAR(AD-01).
Use of materials with a history of successful spacecraft applications and existing specifications and databases will minimize verification efforts.

3.2. MATERIAL CONTROL

Materials used in a conventional process with successful flight heritage and which meet the selection criteria within SPAR(AD-01) will be classified as compliant materials.
Noncompliant materials are any materials not defined as compliant. These will include the materials which meet the requirements but are not used in conventional applications.
Off-the-shelf Hardware for which a detailed materials list is not available and where the included materials cannot be easily identified and/or changed shall be considered to the maximum practical extent.
Noncompliant materials shall be deemed critical, as defined in SPAR(AD-01).

3.3. RESTRICTED MATERIALS

Due to limited life, safety concerns, or known instability, the following materials are not recommended:

A. Beryllium or selenium except internal to hermetically sealed devices.

B. Unalloyed electrodeposited tin unless subsequently fused or reflowed.

C. Corrosive solder fluxes unless detailed cleaning procedures are specified that include verification methods to ensure removal of residual contaminants.

D. Materials which exhibit or are known to exhibit natural radioactivity such as uranium, potassium, radium, thorium or any alloys thereof.

E. Indium and indium solder

F. Magnesium

G. Lithium

4. FORM SHEET

The structuring and recoding of information are based on the ECSS-Q-ST-70(RD-04).

4.1. MATERIAL FAMILES

Materials shall be grouped into the following categories.

Group No.	Description
1	Aluminum and aluminum alloys
2	Copper and copper alloys
3	Nickel and nickel alloys
4	Titanium and titanium alloys
5	Steels
6	Stainless steels
7	Filler metals: welding, brazing soldering
8	Miscellaneous metallic materials
9	Optical materials
10	Adhesives, coatings, varnishes
11	Adhesive tapes
12	Paints and inks
13	Lubricants
14	Potting compounds, sealants, foams
15	Reinforced plastics (including PCBs)
16	Rubbers and elastomers
17	Thermoplastics (e.g. non-adhesive tapes and foils [MLI])
18	Thermoset plastics (including PCBs)
19	Material aspects of wires and cables
20	Miscellaneous non-metallic materials, e.g. ceramics

4.2. FORM SHEET DESCRIPTION

The applicable form sheet is initiated in reference SPAR(AD-01). The content of the dedicated columns of the format is described as follow:

Column No.	Description
1	Document number for materials identification list
2	Part number of end item
3	Revision status
4	Part number of the material
5	Materials name
6	Description of the material
7	Documents number of specification
8	Chemical nature of the material
9	The location where the material is used
10	TML characteristics
11	CVCM characteristics
12	Reference of outgassing information
13	Documents number of applicable process specification

5. DECLARED MATERIAL LIST

This DML represent all metallic and non-metallic materials used for the satellite. Materials of procured mechanical parts are not listed here.

5.1. ENVIRONMENTAL CONDITIONS

The Lumir form sheet provides columns for the specification of the environment. Since the environmental conditions are nearly the same for all materials, such columns don’t need to be established.

5.2. THERMAL VACUUM STABILITY

An important point is the limitation of condensation effects in orbit since this causes problems with optical equipment. Therefore the use of materials with a history of successful spacecraft application and materials that don’t meet the requirements will be accepted only if proper measures for reducing the out gassing are foreseen (RFA). Special attention will be given to the CVCM values.

APPENDIX A DML FOR SBC

DECLARED MATERIALS LIST (DML)

Programme name: KPLO DTN			CI no.:			Doc no.: KPLO-D1-554-016			Date: 2018-10-15		
			Group (Title):			Issue/Revision: 1.0			Page: 1		
1	2	3	4	5	6	7	8	9			10
								9.1	9.2	9.3	
Item no. and user code	Commercial identification or standardized designation	1) Chemical nature 2) Product type	1) Manufacturer/ supplier name 2) Procurement spec. Issue/RevDate	Summary of process parameters	1) Subsystem 2) Equipment 3) Use	1) R 2) A 3) T	1) A 2) V 3) M	Acronym/ rating/ Validation Ref. for applicable properties	1) Justification for approval 2) Prime comments	Prime approval status	Customer approval status/ comments
1 001	6061 T6 (quivalent to)	1) Al Zn5.5 Mg2.5 Cu1.5 2) Plate	1) Alcoa 2) T7351		1) DTN 2) SBC 3) Housing	1) I 2) V 3) 4-5		-	1) Data sheet		
6 001	Heat-Resistant Steel	1) 2) Bolt	1) Alcoa 2) NAS1352-N04-6		1) DTN 2) SBC 3) Connecting	1) I 2) V 3) 4-5			1) Data sheet		
6 002	Passivation of Corrosion Resistant Steels	1) 2) Washer & Helicoil	1) Alcoa 2) NAS620-C4		1) DTN 2) SBC 3) Connecting	1) I 2) V 3) 4-5			1) Data sheet		
7 001	Solder	1) Sn62 Pb36 Ag2 2) Solder paste	1) ELSOLD 2)		1) DTN 2) SBC 3) SMT	1) I 2) V 3) 4-5			1) ECSS-Q-ST-70-08 DIN32513 IPC-J-STD-004B		

7 002	Solder	1) Sn60Pb40 2) Solder Wire	1) ELSOLD 2)		1) DTN 2) SBC 3) Manual Soldering	1) I 2) V 3) 4-5			1) ECSS-Q-ST-70-08 DIN EN 29453 & DIN EN 29454-1		
7 003	Solder	1) Sn60Pb40 2) Solder Bar	1) ELSOLD 2)		1) DTN 2) SBC 3) SMT	1) I 2) V 3) 4-5			1) ECSS-Q-ST-70-08 DIN EN ISO 9453		
7 004	Koloflux 136-25	1) Rosin based 2) Flux FSW-32/1.1.3	1) Chemet 2)		1) DTN 2) SBC 3) SMT	1) I 2) V 3) 4-5			1) ECSS-Q-ST-70-08		
7 005	Koloflux 131-33	1) Rosin based 2) Flux FSW-26/1.1.2	1) Chemet 2)		1) DTN 2) SBC 3) SMT	1) I 2) V 3) 4-5			1) ECSS-Q-ST-70-08		
10 001	2216 B/A	1) Modified epoxy based 2) Epoxy adhesive	1) 3M 2)		1) DTN 2) SBC 3) Skating	1) I 2) V 3) 4-5			1) Data sheet DIN EN 29454-1		
10 002	Humiseal-1B31	1) Polyurethane 2) Conformal Coating	1) Chase 2)		1) DTN 2) SBC 3) Coating	1) I 2) V 3) 4-5			1) Data sheet DIN EN 29454		
17 001	THT-24-423-1 / R6002	1) Polyimide with acrylic adhesive 2) Name-Plate	1) Brady 2)		1) DTN 2) SBC 3) Name-Plate	1) I 2) V 3) 4-5			1) Datasheet		

12 001	Anodizing	1) Anodic Oxidation 2) Black Thermal Control	1) 2)		1) DTN 2) SBC 3) Painting	1) I 2) V 3) 4-5			1) ECSS-Q-70-71		
12 002	CROMATE LN9368-4301	1) Nickel-Phosphorous 2) Plating of Al& Al-alloys	1) 2)		1) DTN 2) SBC 3) Painting	1) I 2) V 3) 4-5			1) ECSS-Q-70-71		
18 001	PCB Arlon 85N	1) polyimide / acrylic / copper 2) PCB ridgid	1) 2)		1) DTN 2) SBC 3) PCB	1) I 2) V 3) 4-5			1) ECSS-Q-ST-70-10C		