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Electric/Electronic (E/E) components and assemblies

Purpose

The IMDS Steering Committee encourages all suppliers to submit IMDS data according to Rec. IMDS 001 for electronic components and materials at all levels of the supply chain. Only under the special conditions described below, is it acceptable to deviate from Rec. IMDS 001 processes for the reporting of E/E components and assemblies.
This recommendation describes the general requirements for the creation of Material Data Sheets (MDSs) for E/E components, assembled printed circuit boards (PCB/PWB, including flexible circuit boards (FCP)), and hybrid electronics (standard LTCC[1)] used in automotive applications.
This recommendation does not cover parts connected to E/E components such as housings or mounting plates, which must be reported according to IMDS Recommendation 001. Compositional data on modules to create widely used E/E assemblies are available as published material data sheets (as semi-component MDSs as described in section 4).
If the modules described in this Recommendation are to be used in an MDS, **the supplier must have obtained evidence** per Rec. IMDS 001 Section 3.1 (General Reporting) from the sub-tier suppliers that all materials meet the predefined material descriptions and ranges of the standard materials. Upon special request by the customer, the supplier utilizing the IMDS reporting has to prove per evidence that he has collected all material data from its sub-tier levels (Rec. 001 Rule 5.2.D). **Any use of standard materials does not substitute the supplier's mandate to track and gather all necessary material information along the total sub-tier supply chain**. This mandatory process of material tracking and obtaining of information must be proven to be in full compliance with legal requirements.

References

- IMDS001 General Structure
- Global Automotive Declarable Substance List (www.gadsl.org)
- EC Directive 2000/53/EC with latest version of Annex II with its exemptions with regard to E/E (Electric/Electronic) components and assemblies
- EC Directive 2005/64/EC (RRR-Type Approval Directive)
- Regulation EC 1907/2006 REACH
- Automotive Industry Interpretation Guide for ELV Annex II with IMDS Information added by the IMDS Steering Committee

[1] Low Temperature Co-fired Ceramic

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Definitions

Printed circuit boards (hereinafter PCBs) or hybrid electronics are complex assemblies which sometimes consist of more than 100 components, often with very small weights. To facilitate the material data reporting process, a number of standard modules (described as semi-component type datasheets) have been developed (see Section 4). These specific modules and compounds can be found by searching for Company ID 102677 (ZVEI-Rec019) within IMDS published semi-component MDSs.
There are four main types of modules:

Standard – which describes the materials, substances, and percentages of most PCB assemblies based on an in-depth analysis of previously reported components. This composition is independent of the laminate layer count and can be used for most assemblies. This standard PCB composition will contain a leaded ceramic material according to ELV 2011 Annex II (10a) representing the most widely used leaded ceramics components found in a PCB.

Standard without Leaded Ceramics – which describes the materials, substances, and percentages of newer technology PCB assemblies not containing any leaded ceramic components.

High Component Load – which contains a higher percentage by weight of components (typically >45% of assembly weight). These assemblies generally have a higher percentage of large components (e.g. electrolytic capacitors and Inductors). This indicates a slightly different material composition, based on more special metals and other slight differences from the standard main module. This module also contains a leaded ceramic material according to ELV 2011 Annex II (10a) representing the most widely used leaded ceramics components found in a PCB.

High Component Load without Leaded Ceramics – which describes the materials, substances, and percentages of newer technology PCB with a higher percentages by weight of components AND not containing any leaded ceramic components.

If the substance composition of a component is not covered by one of the standard modules, the respective component must be reported individually. The addition of new application codes for leaded ceramic applications will require analysis of PCB components used in the assembly. This separate reporting must also be done if GADSL substances are present above the appropriate thresholds that are not disclosed in the standard module. Additionally, mechanical parts (such as screws, cooling sheets, wiring, etc.) are usually present and must be reported separately according to Rec. IMDS 001.
Concerning substances and material range rules, naming conventions, the modules prepared by ZVEI Company ID 102677 undergo the same rule checks (4.4.3.B, and 4.5.4.B) as the IMDS SC published modules.

This recommendation will be reviewed yearly and also if the relevant legislations are revised. During these reviews, necessary updates to the recommendation will be made. As the legislative situation changes, this recommendation may become deactivated in the future and full reports according to Recommendation 001 will then have to be made.

Standard modules for E/E PCB assemblies

This chapter describes how the modules for E/E assemblies can be used. *This recommendation does not reflect all possible E/E) PCB assembly applications and ELV Annex II exemptions (e.g. 8b, 8d…).*

Flow Chart and Structure of an assembly created with the help of the prepared modules

In order to create a PCB, the IMDS user should select the appropriate modules to describe their part. Main module semi-components are released within the ZVEI-REC019 IMDS Company ID (102677) for use in describing the materials used within printed circuit boards. **These modules do not contain the solder materials, which must be added separately**. The ZVEI-REC019 is not responsible for the accuracy of individual company declarations. As stated above, use of the ZVEI-REC019 semi-components and materials does not substitute for the supplier's mandate to track and gather all necessary material information along the total sub-tier supply chain and verification of material composition.
IMDS IDs of ZVEI-REC019 modules are given in the table below as well as examples for process solder. Process solder is used to solder the components and mechanical parts (e.g. connector) to the PCB. Other Lead based solders are to be added to the assembly, as appropriate and applicable, for identification of other ELV exemptions per the flowchart below. The application codes for modules, process solder, and component solders cannot be identified until the ZVEI-REC019 and other semi-components and materials are inserted into an MDS as a child node to the PCB assembly component.

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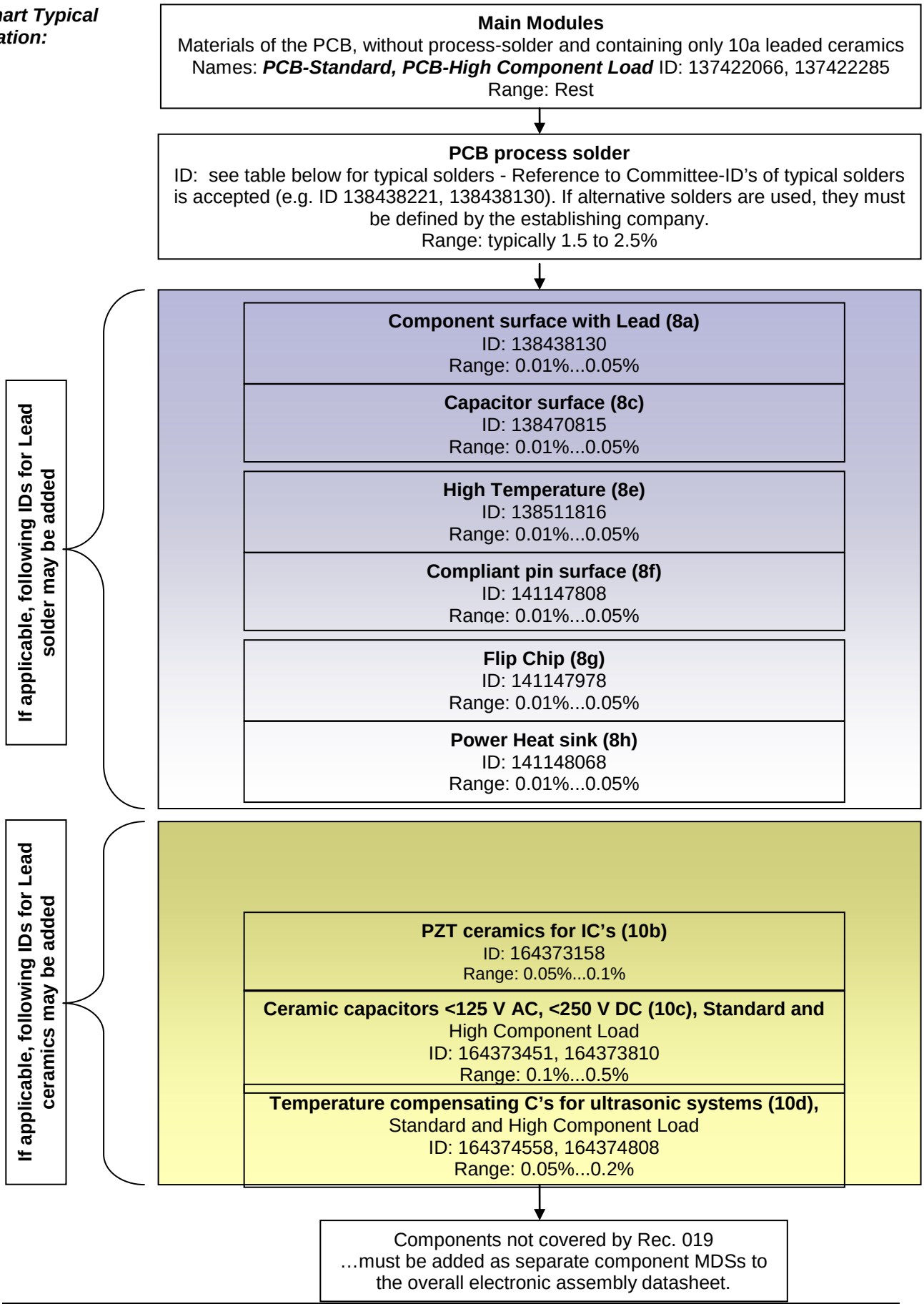
Flowchart Typical Application:



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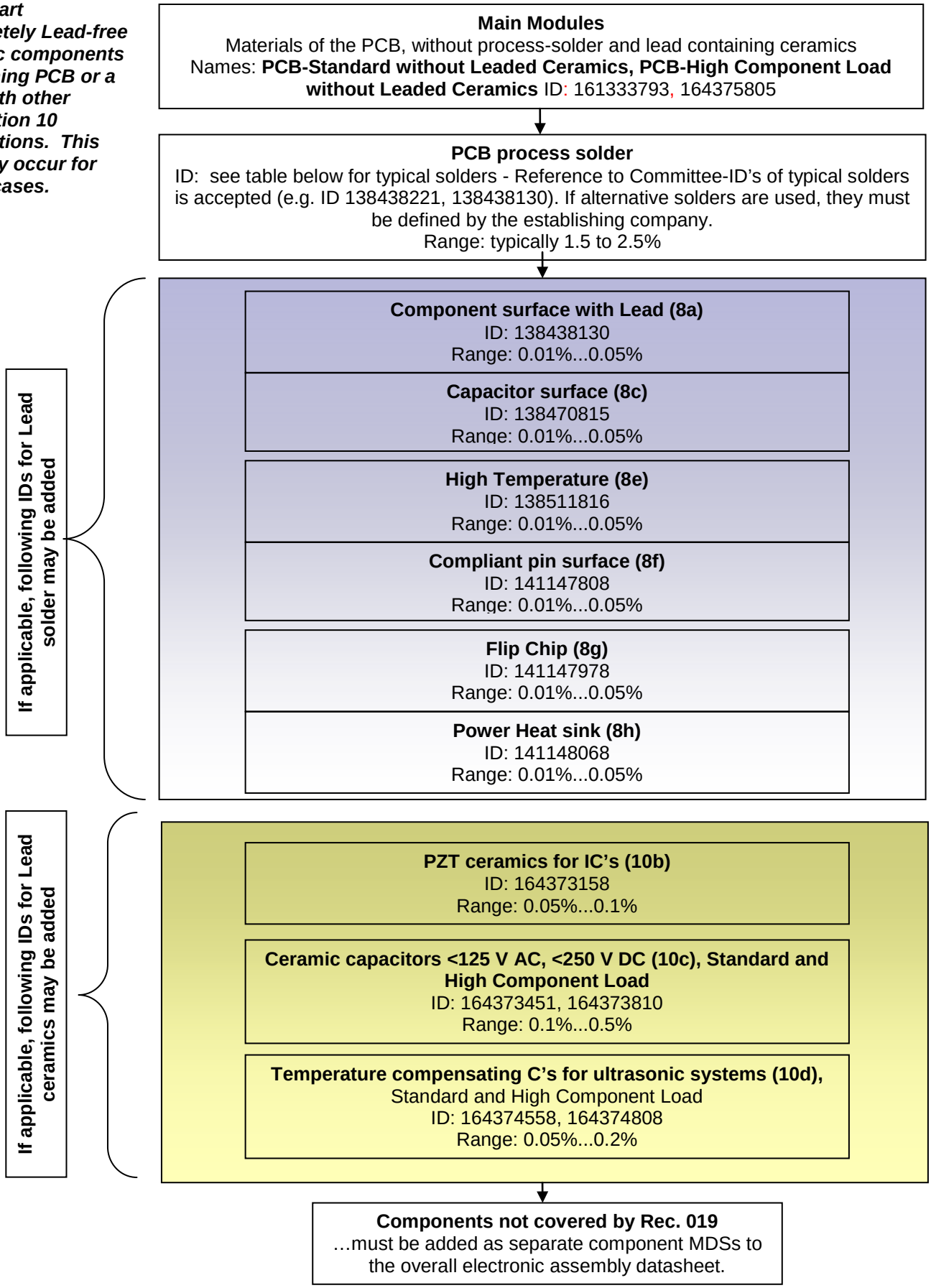
Flowchart Completely Lead-free ceramic components containing PCB or a PCB with other Exemption 10 applications. This will only occur for minor cases.



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Description of standard modules and additional available semi-component MDSs

MDS name	MDS ID	MDS name IMDS
"Main module" - Standard	137422066	PCB-Standard
"Main module" – High Component Load	137422285	PCB-High Component Load
"Main module" – Standard without Leaded Components	161333793	PCB-Standard without Leaded Ceramics
"Main module" - High Component Load without Leaded Components	164375805	PCB-High Component Load without Leaded Ceramics
Process solders (typical)	138438221 141149865	PCB-Solder S-Sn96Ag3Cu1 (Sn96,5Ag3Cu0.5) PCB-Solder S-Sn63Pb37
Component solders (typical) to be used for additional needed references of Lead uses below:		
- Component surface with lead (8a)	138438130	PCB-Component surface with Lead (8a)
- Capacitor surface (8c)	138470815	PCB-Capacitor surface (8c)
- High Melting Temperature (8e)	138511816	PCB-High Temp solder (8e)
- Compliant pin surface (8f)	141147808	PCB-Compliant pin surface (8f)
- Flip chip (8g)	141147978	PCB-Flip Chip (8g)
- Power heatsink (8h)	141148068	PCB-Power Heat sink (8h)
Typical content range of Lead containing solders is defined in the flow chart		**Others to be created by IMDS user individually**
Component leaded ceramics (typical) to be used for additional needed references of Lead uses below (excepting 10a per main modules)		
• PZT ceramics for IC's (10b)	164373158	PCB-PZT ceramics for IC's (10b)
• Ceramic capacitors <125 V AC, <250 V DC (10c), **Standard**	164373451	PCB-Ceramic capacitors <125 V AC, <250 V DC (10c), **Standard**
• Ceramic capacitors <125 V AC, <250 V DC (10c), **High Component Load**	164373810	PCB-Ceramic capacitors <125 V AC, <250 V DC (10c), **High Component Load**
• Temperature compensating C's for ultrasonic systems (10d), **Standard**	164374558	PCB-Temperature compensating C's for ultrasonic systems (10d), **Standard**
• Temperature compensating C's for ultrasonic systems (10d), **High Component Load**	164374808	PCB-Temperature compensating C's for ultrasonic systems (10d), **High Component Load**
Typical content range of Lead containing ceramics is defined in the flow chart		**Others to be created by IMDS user individually**

Components not covered by Rec 019 (see Section 3, 2nd paragraph)

Mechanical parts such as screws, cooling sheets, etc. must be reported according to Rec. IMDS 001. **It is important to remember Rec. IMDS 001 Rule 4.1.A concerning child nodes of the same parent node must be of the same type**.

Standard rules and guidelines for E/E (PCB components)

Suppliers of electrical and electronic components that are mounted to the PCB or Hybrid Assembly, including active and passive elements, must deliver a full Bill of Material (BOM), including full disclosure of all substances, to the assembly supplier with the qualification of the product. Substances that are not

declarable or prohibited according to GADSL or do not require an application code may be marked *confidential* (per Rec. IMDS 001 Section 4.5.2) or highly confidential (jokers/wildcards) per Rec. IMDS 001 Section 4.5.3. The use of confidential substance declaration is preferred over the use of jokers/wildcards due to the ability to more easily track these substances in the case of needed updates for future legislation (e.g. REACH SVHC updates).
Reports on PCB components in IMDS, Umbrella Spec, IPC1752 or similar format are accepted, if agreed between the business partners. For IPC 1752 formats, Class 5 or 6 reporting with the use of all additional substances found in the GADSL must be disclosed.
If Lead is contained, a reference to the specific application code (8a-8j, 10a-10d) derived from the ELV-Directive must be made.
In the case a declaration is made in IMDS following provision can be used:

Materials of small electronics components. This applies to electronics parts weighing less than 5g [2].

- may be reported using material class 8.1
- Standard Material Numbers, Symbols, and Norms/Standards can be simplified per Rec. IMDS 001 as shown in Section 4.4.2.E, 4.4.2F and 4.4.2I.

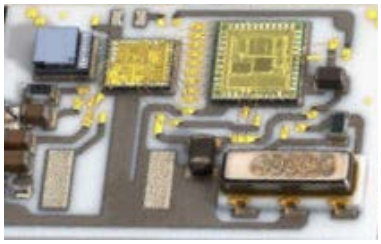
Hybrid Electronics

Standard modules for E/E (Electric/Electronic) hybrids

For assembled standard hybrid electronics the following modules are available in IMDS. To facilitate the search function, please search the IMDS database for published semi-components, enter the article name “*Hybrid-St*” and choose IMDS Company ID 102677.

Hybrid-St (e.g. for sensor applications)

Thick and thin film circuits on ceramic base material



Hybrid-St-Cu (e.g. for power applications)

DCB / DBC (direct copper bonding / direct bonding copper)

[2] These requirements will be reviewed during the REC019 annual analysis.

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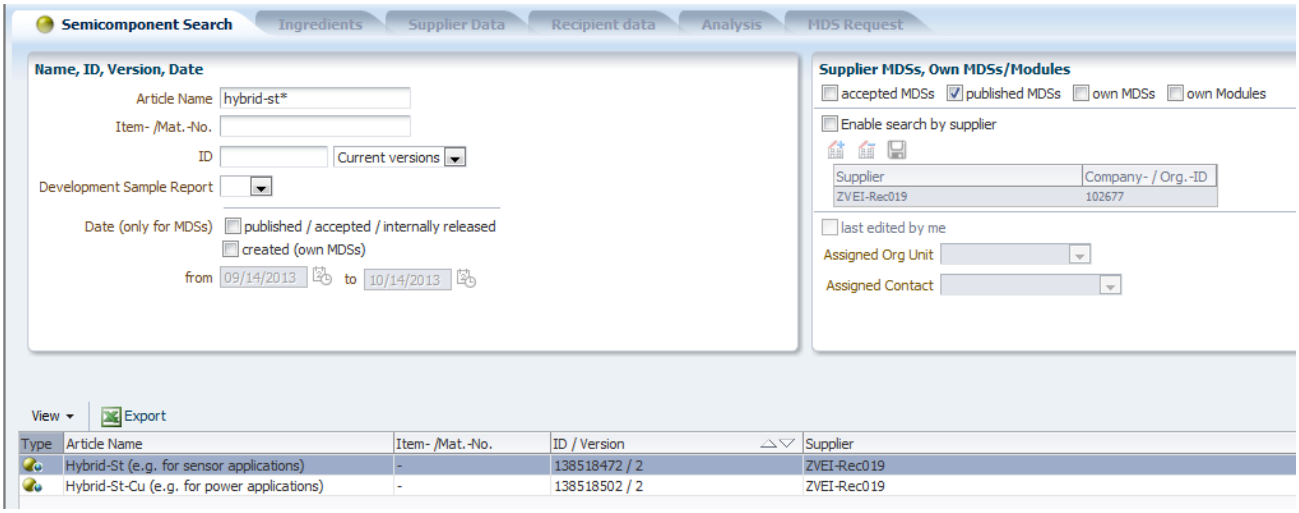
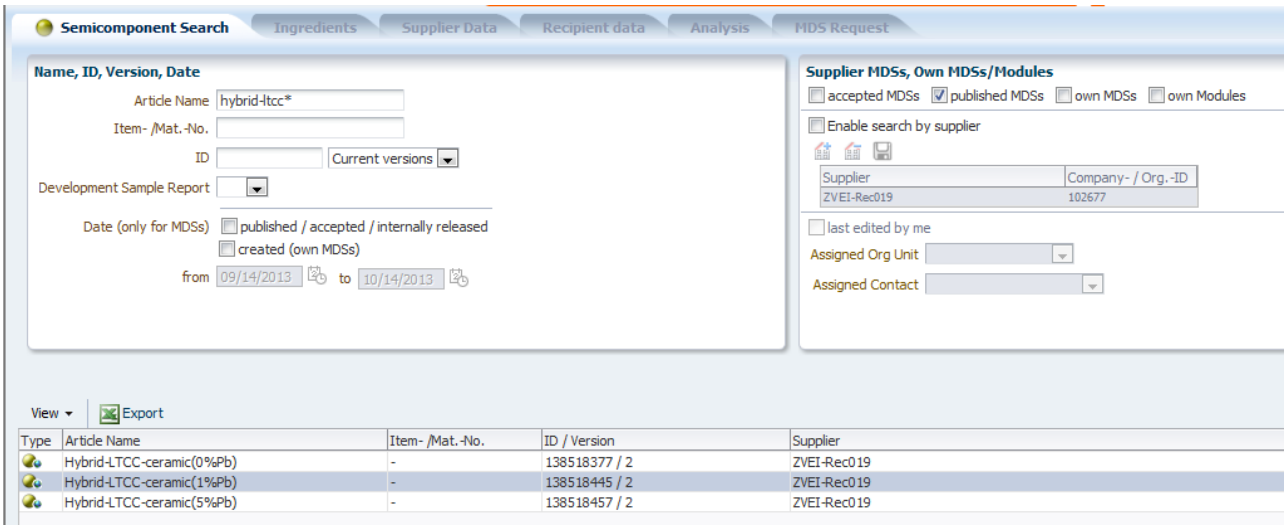


Base materials for Ceramic Hybrid Electronics (LTCC Hybrids)

For assembled ceramic hybrids (LTCC = **L**ow **T**emperature **C**o-fired **C**eramic) the following three standard semi-components in three versions (two leaded, one lead-free) are available in IMDS. To facilitate the search function, please search the IMDS database for semi-components, enter the article name “*Hybrid-LTCC*” and choose supplier-ID IMDS Company ID 102677 or chose published semi-components.



Glossary

Component	Electronic component like e.g. capacitor, IC, resistor, that typically populate a PCB
Assembly	Populated printed circuit board or hybrid
Electric	Relating to the flow of electricity
Electronic	A device constructed using one or more electric elements that make it possible to manage the flow of electricity
Full Bill of Material (BOM)	Full list of components and materials for product
Hybrid	Electronic circuit assembly, typically ceramic substrate
PCB, PWB	Printed circuit board, printed wiring board
Umbrella Spec	Data Format created by the German Association of Electric and Electronic Industry (ZVEI) based on IEC PAS 61906 to support a full Material Information of product classes (see also Umbrella Specs - Guideline and Form (ZVEI) Ver. 4.1)

Transition Period

This Recommendation IMDS 019 shall enter into force 3 months after publication. After this transition period all previous versions of Rec. IMDS 019 will be invalid and only this version will be effective.

Release and Revisions

Release

The proposal was first approved and released on October 30th 2003

Revision

Rev.	Date	Description/ Reason	Released by
1	2005/04	Was Issue November 2003 Editorial changes Hybrids (standard and LTCC), wire harnesses added	IMDS-SC
2	2007/02	Was Issue April 2005 Paragraph 1: reworked Paragraph 4: Example removed, following paragraphs renumbered Paragraph 4.3: updated Paragraph 5: added Paragraph 6: added Paragraph 7: removed, following paragraph renumbered	IMDS-SC

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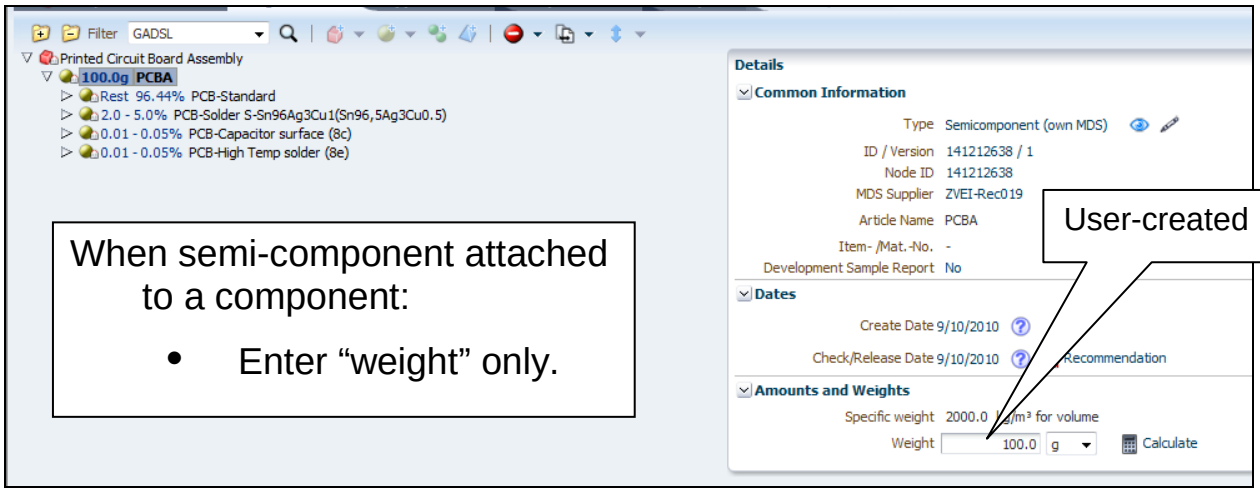
Rev.	Date	Description/ Reason	Released by
3	2010/08	Rework of content of the whole document	IMDS-SC
4	2011/08	Add content specific to new ELV Annex II with respect to Exemption 10 Lead in Ceramics Paragraphs about modules Annex changes	IMDS-SC
5	2013/10	Change screenshots due to IMDS Release 8.0	IMDS-SC

Annex

The following examples are shown to illustrate the use of the modules and additional information as needed.

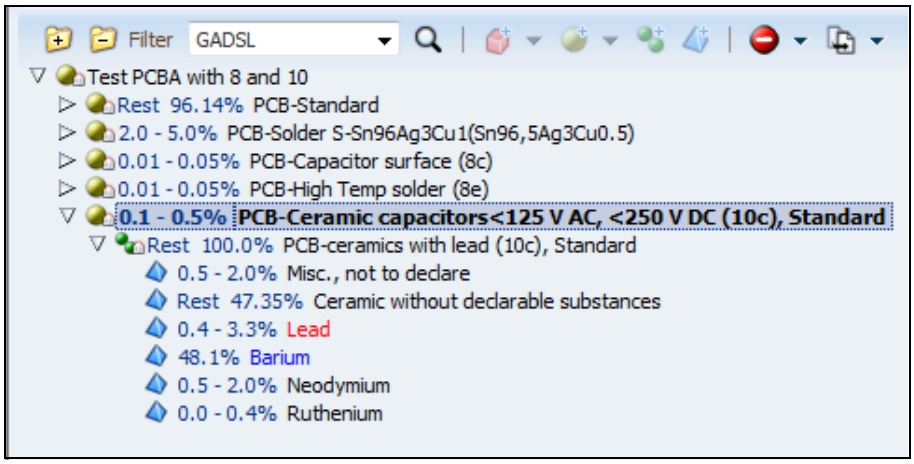
Preferred structure:

The semi-component modules, as defined in the flow chart and in chapter 4.1, are to be added to an additional semi-component ("PCBA" in below examples) **created by the user**. The weight of this created semi-component can be entered as the weight of the parent PCB created component ("Printed circuit board assembly" in below examples).



The user will be required to enter a specific weight (density) prior to the release of the company created semi-component. We suggest 2000 kg/m^3. Please note that the ZVEI components contain an approximate value for a specific weight, as this is required by IMDS Recommendation 001.

Additional semi-components were created for the Annex II Lead in Ceramics with example below.
As for other lead in solder applications (e.g. 8e Lead in High Melting Temp Solder), the use of the other exemption 10 application codes must be evaluated on a case by case basis for your particular assembly.



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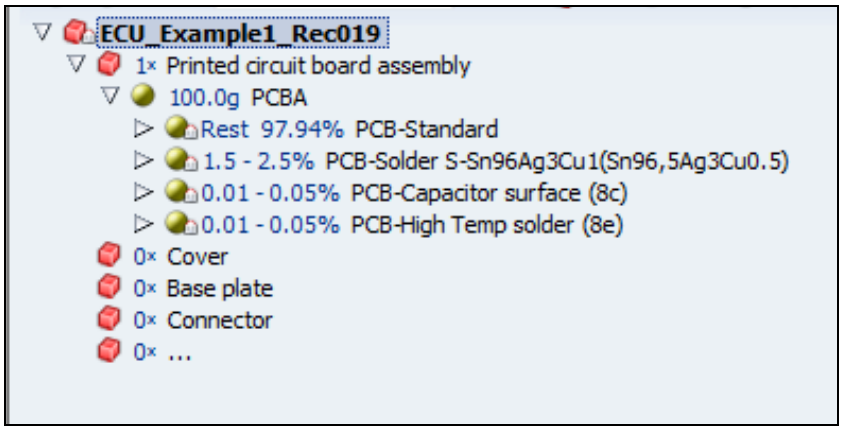
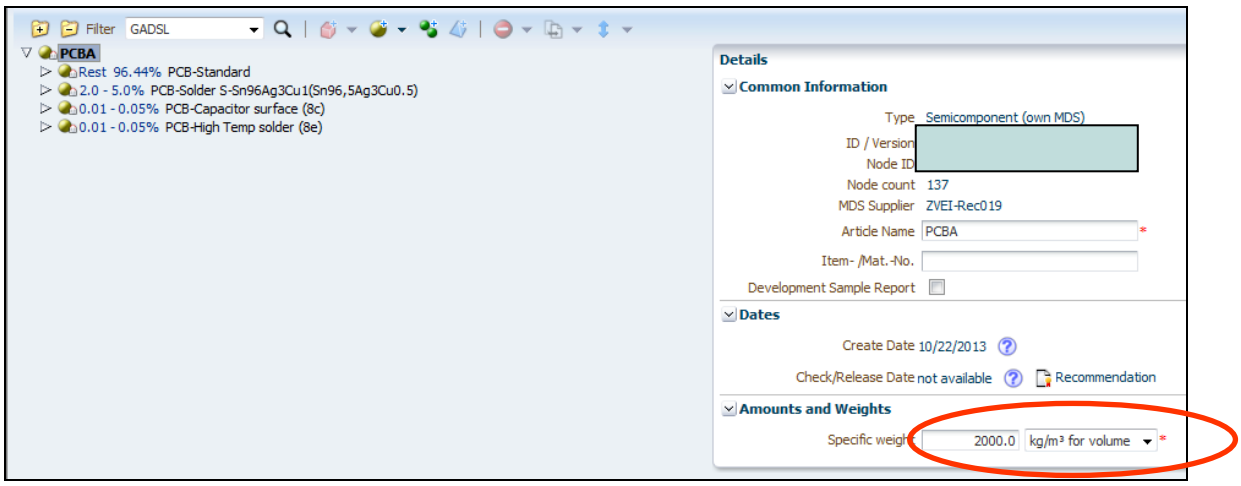
An example of a complete electronic product is shown below with additional components added by usage.



Semi-component Specific Density:

The user will be required to enter a specific weight (density) prior to the release of the company created semi-component. We suggest 2000 kg/m^3. Please note that the ZVEI components contain an approximate value for a specific weight, as this is required by IMDS Recommendation 001.



When adding the ZVEI semi-components as child nodes to the company created semi-component, please use weight percentages as shown in the flowchart section 4.2. A manual calculation of the volume (e.g. adding amounts as m^3) is not to be used. Based on this IMDS structure, the values of the other ZVEI modules (e.g. PCB-Solder S-Pb90Sn10) can be added directly by weight percentage as defined in the flow chart.
The value of the main module "PCB-Standard" is defined as "Rest"".

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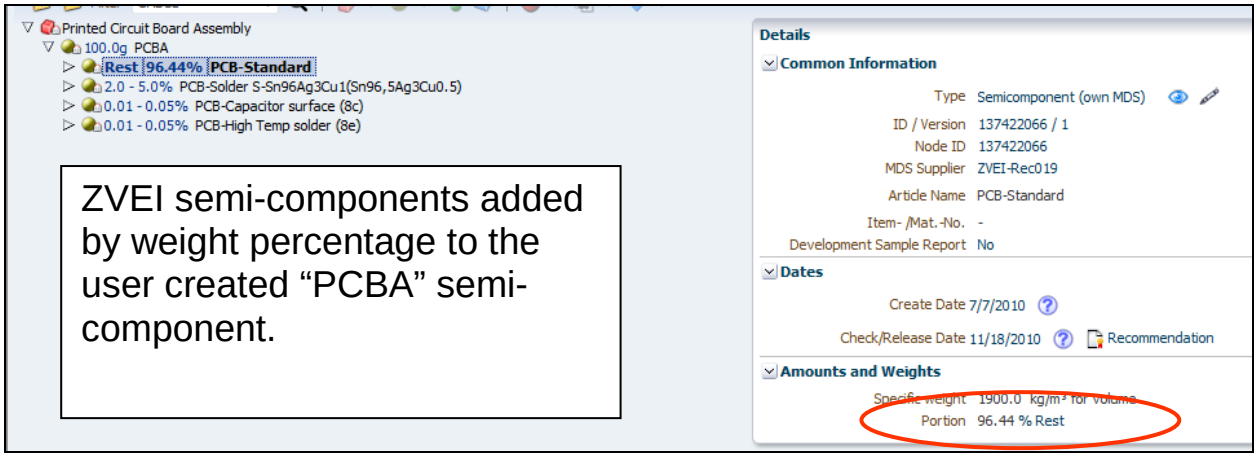
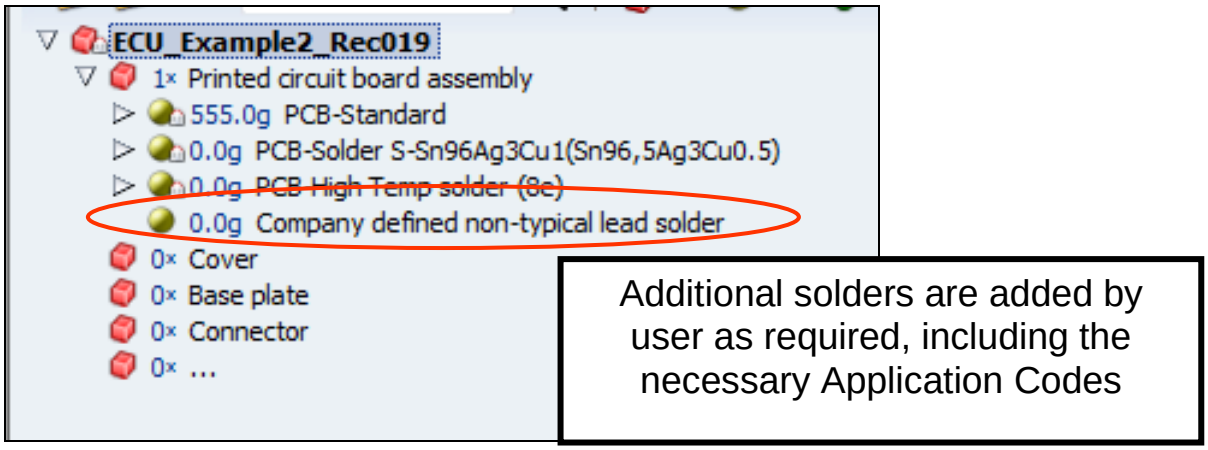


ECU Example 2 – Additional non-typical solder created which is added by the user.



Application Codes:

Application codes for all lead and other uses must be identified by the user prior to release of their printed circuit board assembly. ZVEI semi-components DO NOT contain application codes. You must assign them when the modules are attached to a component. Some ZVEI materials contain more than one substance requiring an application code. Please see below for an example of typical selections for lead in ceramics found within a module.

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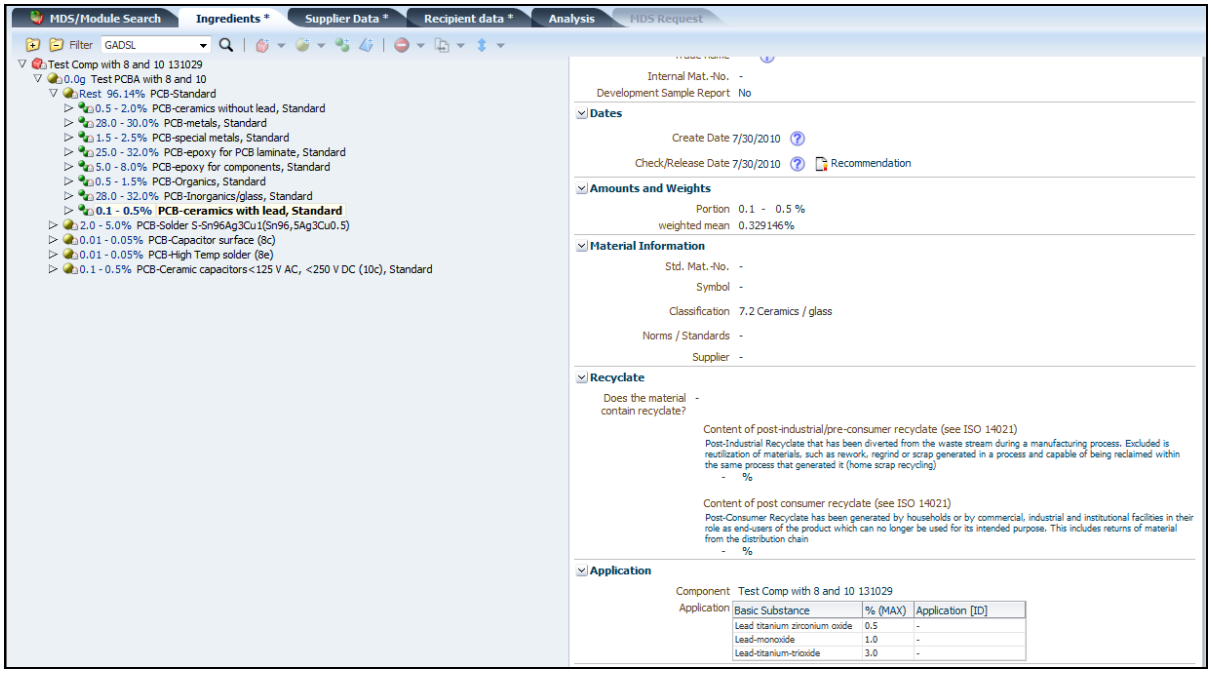
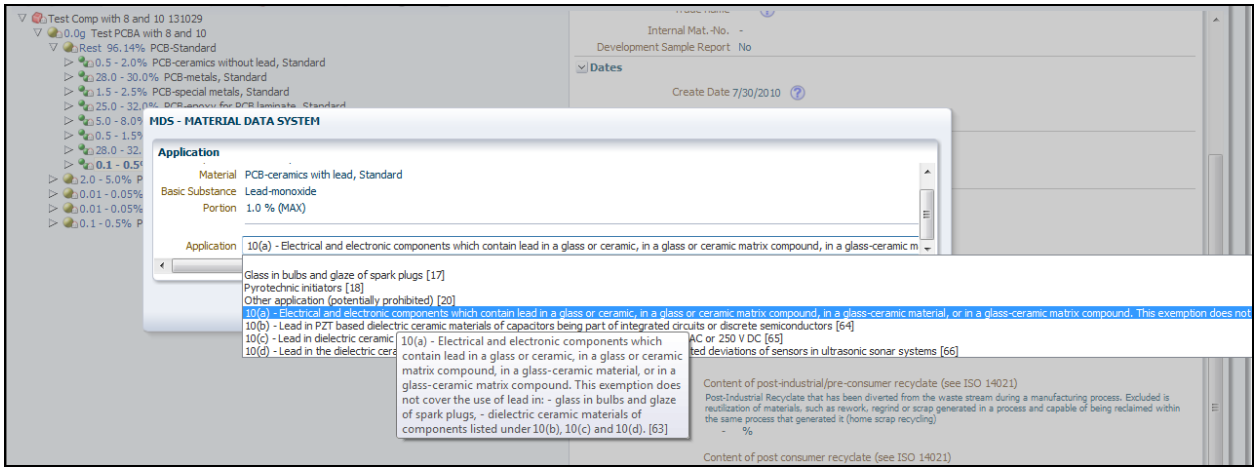


New application codes for the exemption 10 lead in ceramics will have to be entered for each of the lead compounds. Generally, these will be 10a - , but again you will have to evaluate the uses of your lead ceramic applications. The example below is for a 10a component found within the PCB-Standard.



If you have a Lead-free ceramic PCB assembly, you will have to use the new PCB-Standard without Leaded Ceramics.
If you also have 10b through 10d ceramic applications you will have to add those ceramic material semi-components separately.