



Celestica Requirements for RoHS Compliant Solder

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1. PURPOSE

This document defines additional Celestica requirements applicable to RoHS-compliant solder. When referenced on QSPEC's, Purchase Orders, Request for Quotation or in Contracts, suppliers must comply with the requirements specified in this document, in addition to requirements outlined in "Celestica's General Quality Requirements for Chemical and Consumable Items" (Document Number: CELQ-033-STD-62).

The supplier shall not dispatch any goods to Celestica, which vary from the exact specification ordered by Celestica without receiving prior written consent from the Celestica Purchasing Department. Celestica reserves the right to reject the entirety or any part of a shipment that does not conform to this specification.

The standard documents listed below ("Related Documents") are referenced in this Agreement and Seller acknowledges and agrees that it has a copy of the Related Documents in its possession on the Effective Date. Seller agrees to adhere to the terms and standards set out in the Related Documents (as they are updated and amended from time to time) and shall be responsible for ensuring that it is always in possession of the latest update version of the Related Documents. Celestica Specifications listed below are available through Celestica Internet Web Site:

<http://www.celestica.com/SupplyChain/SupplyChain.aspx?id=798>

The Related Documents are as follows:

- (a) CELQ-033-POL-15 – Celestica Environmental Requirements for Chemicals / Consumables
- (b) CELQ-033-STD-62 – Celestica General Quality Requirements for Chemical / Consumable Items
- (c) IPC 1066 -Marking, Symbols and Labels for Identification of Lead-Free and Other Reportable Materials in Lead-Free Assemblies, Components and Devices

2. APPLICABILITY

This document applies to solder materials (materials based on SAC and SnCu solder alloys, such as solder bars, solder pastes, solder cored wires, solder performs) when referenced in an appropriate Celestica request for quotation, purchase order, contract, or QSPEC. It then becomes part of any such document. All questions must be referred to the Celestica Purchasing Department.

3. SPECIFICATION

3.1 Acceptance/Reject Criteria

3.1.1 Acceptance/Reject Criteria for SAC Alloys

Item	Parameter	Requirements	Units	Analytical Procedure
1	Tin (Sn)	Balance	wt%	ICP-AES
2	Silver	3.0 ± 0.2 (SAC 305) 3.9 ± 0.2 (SAC 405)	wt%	ICP-AES

3	Copper (Cu)	0.5 ± 0.2 (SAC 305) 0.6 ± 0.2 (SAC 405)	wt%	ICP-AES
Impurities				
4	Aluminium (Al)	0.001 max.	wt%	ICP-AES
5	Antimony (Sb)	0.050 max.	wt%	ICP-AES
6	Arsenic (As)	0.020 max.	wt%	ICP-AES
7	Bismuth (Bi)	0.050 max.	wt%	ICP-AES
8	Cadmium (Cd)	0.001 max.	wt%	ICP-AES
9	Chromium (Cr)	0.080 max.	wt%	ICP-AES
10	Gold (Au)	0.002 max.	wt%	ICP-AES
11	Indium (In)	0.010 max.	wt%	ICP-AES
12	Iron (Fe)	0.010 max.	wt%	ICP-AES
13	Lead (Pb)	0.050 max.	wt%	ICP-AES
14	Mercury (Hg)	0.050 max	wt%	ICP-AES
14	Nickel (Ni)	0.005 max.	wt%	ICP-AES
15	Phosphorus (P)	0.002 max.	wt%	ICP-AES
17	Sulphur (S)	0.001 max.	wt%	ICP-AES
18	Zinc (Zn)	0.001 max.	wt%	ICP-AES
19	Melting Range	217 – 220 (SAC 305) 217 – 220 (SAC 405)	°C	ASTM E 794-98

All acceptance/reject criteria for SAC alloys must conform to the above specifications.

3.1.2 Acceptance/Reject Criteria for SnCu Alloys

Item	Parameter	Requirements	Units	Analytical Procedure
1	Tin (Sn)	Balance	wt%	ICP-AES
2	Copper (Cu)	0.50 -0.80 max	wt%	ICP-AES
Impurities				
3	Aluminium (Al)	0.001 max.	wt%	ICP-AES
4	Antimony (Sb)	0.050 max.	wt%	ICP-AES
5	Arsenic (As)	0.020 max.	wt%	ICP-AES
6	Bismuth (Bi)	0.050 max.	wt%	ICP-AES
7	Cadmium (Cd)	0.001 max.	wt%	ICP-AES
8	Chromium (Cr)	0.080 max.	wt%	ICP-AES
9	Gold (Au)	0.002 max.	wt%	ICP-AES
10	Indium (In)	0.010 max.	wt%	ICP-AES

11	Iron (Fe)	0.010 max.	wt%	ICP-AES
12	Lead (Pb)	0.050 max.	wt%	ICP-AES
13	Mercury (Hg)	0.050 max	wt%	ICP-AES
14	Nickel (Ni)	0.005 max.	wt%	ICP-AES
15	Phosphorus (P)	0.002 max.	wt%	ICP-AES
16	Silver	0.05 max	wt %	ICP-AES
17	Sulphur (S)	0.001 max.	wt%	ICP-AES
18	Zinc (Zn)	0.001 max.	wt%	ICP-AES
19	Melting Range	227 +/-2	°C	ASTM E 794-98

All acceptance/reject criteria for SnCu alloys must conform to the above specifications.

Note: Some special SnCu alloys are “doped” with elements, which are “intentionally added”. Among these elements, but not limited: Nickel, Silver, Germanium, and Bismuth. In this case such elements will not fall under “impurities” class.

3.2 Environmental Requirements

Compliance with Celestica Environmental Requirements for Chemicals / Consumables (Document number: CELQ-033-POL-15) is required.

3.3 Product Identification

The bar shall possess distinctive Pb-free markings and symbols, as outlined in document IPC-1066 (soon to be supplanted by J-STD 609). This requirement is in addition to the requirements set out in Section 3.3 of Celestica’s General Quality Requirements for Chemical and Consumable Items (Document number: CELQ-033-STD-62).

3.4 Certificate of Analysis

Supplier shall ensure that all materials comply with relevant technical specifications. Each lot of material shall be analyzed prior to shipment and a certificate of analysis, containing items 1 through 15 in section 3.1 as determined by the manufacturer, is to be furnished with each shipment.

3.4.1 Any Standard Analytical Procedures of sufficient accuracy can be used.

3.5 Date Code Restriction

Unless otherwise agreed in writing by Celestica, the supplier shall ensure that all materials identified as requiring manufactured date codes, carry manufactured date codes that do not predate the date of delivery to Celestica by more than six months.

4. INCOMING INSPECTION

All testing (internal to Celestica only) is to be performed by the Materials Laboratory upon engineering request.

The responsible engineer will specify the items to be tested. Inspection will verify these items are within specifications, and will notify the responsible engineer of any non-conformance.

Any Standard Analytical Procedures of sufficient accuracy can be used.

If any question arises regarding the compliance of the material with Celestica's requirements, all such questions will be resolved through the use of the testing procedures set forth in Appendix A of this document: ICP-AES testing procedures.

5. APPENDIX A

Elemental Composition Determination of SAC Solder Alloys by ICP-AES

Note on Safety:

This document does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practice and determine the applicability of regulatory limitations prior to use. Celestica personnel are to refer to local CELESTICA safety and toxicity documents.

1. Scope

This document specifies a standard procedure for determining the weight percentage composition of SAC (Sn/Ag/Cu) solder alloys.

2. Test specimen

About 1.1 g of solder paste or solder wire or 1 g of solder alloy obtained from the melted bar (melt at least 500g and mix thoroughly before sampling).

3. Apparatus and Reagents

- a. Inductively Coupled Plasma (ICP): Perkin Elmer Optima 3000 or equivalent
- b. Software for elaboration of ICP data (i.e. ICP WinLab)
- c. Analytical balance
- d. Hot plate
- e. Plastic 100ml volumetric flask
- f. Plastic 50 ml volumetric flask
- g. Pasteur pipettes
- h. Aluminium dishes
- i. H_3BO_3
- j. HF(50%)
- k. HNO_3 (65%)
- l. 1000ppm element standards of:
 - Ag
 - Cu
 - Sb
 - Fe
 - Zn
 - Cd
 - As
 - Al
 - Pb
 - Bi
 - Any other required element.

4. Fluoboric mixture preparation

In a 1000ml plastic volumetric flask put:

- 5g H₃BO₃
- 50ml HF (50%)
- 418g HNO₃ (65%)

Add D.I. water up to 1000ml and Mix thoroughly.

5. Standard Preparation

(a) Prepare the standard solutions in six 100ml volumetric flask, according to the following table:

Element	Std 1 (ml/100ml) Chloridric solution		
	Std1 HCl	Std2 HCl	Std3 HCl
Sb	0.1	0.5	1
As	0.1	0.5	1
Al	0.02	0.05	0.1
	Std 2 (ml/100ml) Nitric solution		
	Std1 HN O ₃	Std2 HN O ₃	Std3 HN O ₃
Cu	4	7	10
Ag	1	3	5
Bi	0.1	0.5	1
Pb	0.1	0.5	1
Fe	0.1	0.5	1
Zn	0.02	0.05	0.1
Cd	0.01	0.05	0.1

(b) Add D.I. water up to 100 ml

6. Sample Preparation

If you are analyzing solder bar go to Step 6.4.

6.1 Put 1.1g (technical weight) of solder paste or solder wire in an aluminium dish and melt it by hot plate.

6.2 During the melting process eliminate the flux by a Pasteur pipette.

6.3 Let the sample reach room temperature, then clean it with appropriate solvent (i.e. isopropanol).

6.4 Weight 1g (analytical weight) of alloy and put it in a 100ml plastic volumetric flask.

6.5 Dissolve the sample in 25 ml of fluoboric mixture.

6.6 Add 5 ml of HF.

6.7 When the sample is completely dissolved, add water up to 100ml

6.8 Transfer 1 ml of this solution into a 50 ml volumetric flask (this diluted solution is for the determination of Silver).

6.9 Add water up to 50 ml.

7. Instrument setup

7.1 Set up the instrument according to manufacturer's instructions

7.2 Set the instrument in order to obtain results in weight %.

8. Procedure

8.1 Before the analysis let the plasma torch stabilize for at least 15 minutes.

8.2 Analytical sequence:

- Blank (D.I. water)
- Std 1 HCl
- Std 2 HCl
- Std 3 HCl
- Std 1 HNO₃
- Std 2 HNO₃
- Std 3 HNO₃
- Sample (100ml)
- Sample (50ml) for silver

9. Calculation and reporting

Report the results for each element in weight percentage.

10. Measurement uncertainty

The estimated method uncertainty is 2% for Copper and Silver and 3% for all the other elements.

NOTE: Safety

This document does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practice and determine the applicability of regulatory limitations prior to use. Celestica personnel are to refer to local CELESTICA safety and toxicity documents.